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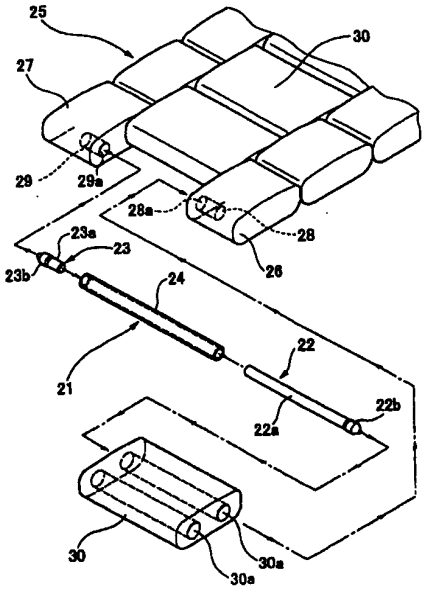
(54) FIXING STRUCTURE FOR BLOCKS AND CONNECTING DEVICE AND STRUCTURES OF CONNECTING PIN AND BLOCK IN BAND-SHAPED ORNAMENT

(57) A connecting member 21 comprises a pipe 24 and a pair of connecting pins 22, 23. Heads 22a, 22b of the connecting pins are forcefully fitted in the pipe so that the pipe is expanded to form expanded portions 24a, 24b in the radial direction thereof. The expanded portions are pressed against inner walls of the connecting holes 28, 29 of links 26, 27 so that the connecting member is secured in the connecting holes 28, 29 of the links 26, 27.

FIG. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a personal adornment band, especially to a band comprising a plurality of links connected to each other, and more particularly to a structure for connecting the links and the connecting members thereof.

BACKGROUND ART

[0002] Referring to Figs. 46 and 47, in a conventional watchband, a pin 3 as a connecting member is inserted into a hole 2a of a connecting link 2 and engages with blind holes 1a formed in a link 1 which correspond to the hole 2a in the lateral direction of the band so that each of the links is . connected to one another.

[0003] At each end of the pin 3, there is formed a knurled portion 3a having a plurality of continual ridges. When each knurled portion 3a is inserted in the hole 1a, the knurled portion 3a is pressed against the inner wall of the hole 1a so that the link 1 and the pin 3 are attached together.

[0004] Thus the connecting link 2 is rotatably connected to the link 1 with the pin 3 as the rotating shaft. The connecting link 2 is similarly connected to adjacent links 1. By repeating the connection, a watchband comprising the links and the connecting links 2 is formed. Other personal adornment bands are formed likewise.

[0005] However, such means for securing the pin to the links by the knurled portion cannot provide a powerful and stable securing force. Namely, when the watchband is worn, an external force due to the rotations of the link 1 and the connecting link 2 is exerted on the pin 3. Thus the inner wall of the connecting hole 1a is abraded by the knurled portion 3a so that the pressure between the pin 3 and the connecting hole 1a of the connecting link 1 is decreased. As a result, the pin 3 often falls out from the link 1.

[0006] Hence, the primary object of the present invention is to provide a personal adornment band wherein the links and the connecting members are forcefully secured to one another.

[0007] Fig. 48 shows a connecting member which enables a link to be detached so that the length of the watchband can be adjusted.

[0008] The connecting member shown in the drawing is a connecting member 4 having a shape of a hairpin which is used more extensively than in a conventional structure. The connecting member 4 comprises a double-folded wire rod having a semicircular cross section. A bent portion 4a is formed at one end of the connecting member 4 and a curved engaging portion 4b is formed at the other end which is an open end.

[0009] The connecting member 4 is, for example, used for connecting a watchband comprising a plurality of links 6 and connecting links 8 for connecting the links 6. Each link 6 has end portions 6a and 6b, formed at each end in the lateral direction of the band, and a bridge 6c for connecting the end portions in the direction of the width of the band. A pair of opposite connecting holes 6d and 6e are formed in the end portions 6a and 6b, respectively, in the lateral direction of the band. The connecting link 8 is formed by rolling a plate into an annular shape and has a hole 8a in the lateral direction of the band wherein the bridge 6c of one of the links 6 is to be inserted.

[0010] A link 10 comprising such a pair of the link 6 and the connecting link 8 is positioned so that a connecting hole 8a of the connecting link 8 communicates with the connecting holes 6d and 6e of the link 6 of an adjacent link 11. The connecting member 4 is inserted in the connecting holes 6d, 6e and 8a so that the links are connected to each other.

[0011] In operation, the connecting member 4 is inserted from the bent portion 4a, and when the engaging portion 4b is pushed inside the connecting hole 6d, due to the elastic force thereof, the outer surface of the engaging portion 4b is forced against the inner surface of the connecting hole 6d, thereby to be engaged. Since the connecting member 4 is held within the holes 6d, 6e and 8a only by the elastic force thereof, when the connecting member 4 is pushed from the side of the bent portion 4a in the lateral direction of the band with a tool, the engaging portion 4b is pushed out from the connecting hole 6d.

[0012] Since the above described conventional connecting amber 4 is formed by bending a fine wire, the strength thereof is low, and moreover, if the watchband is pulled in the longitudinal direction of the band, the connecting member 4 may be deformed or fractured. In particular, if the connecting member 4 is deformed, the connecting member may not be able to be pulled out from the connecting holes 6d, 6e and 8a, thereby rendering it impossible to disengage the links.

[0013] In addition, if the connecting member 4 is repeatedly inserted into and drawn out from the connecting holes 6d, 6e and 8a, the elasticity of the bent portion 4a reduces. Hence the pressure of the engaging portion 4b is decreased so that the connecting member 4 may be disengaged.

[0014] Thus, the second object of the present invention is to provide a structure and a manufacturing method of a connecting pin having a high strength wherein the elastic force thereof is not decreased although the member is repeatedly inserted and drawn out.

[0015] Fig. 49 is a sectional view for explaining another problem of the conventional hairpin connecting member 4.

[0016] When the watcbband is worn, the link 6 and a solid connecting link 8A may be twisted relative to each other as shown in the drawing. In such a state, the inner wall of a hole of the connecting link 8A abuts on the connecting member 4 at a point A so that the connecting member 4 is pushed to the right in the drawing. Hence the connecting member is pushed out from the link, so that the band is disengaged.

[0017] Thus, the third object of the present invention is to provide a structure of a link for a personal adornment band wherein the connecting member is prevented from falling out.

DISCLOSURE OF THE INVENTION

[0018] According to the present invention, there is provided a structure for connecting a link and a connecting member in a personal adornment band, wherein the connecting member is inserted in a connecting hole formed in the link, which comprises, the connecting member comprising a pipe and a connecting pin, the connecting pin having a shaft and a head having an outer diameter larger than the outer diameter of the shaft, the head of the connecting pin being forcefully fitted in the pipe so that the pipe is expanded to form an expanded portion in the radial direction thereof, the inner diameter of the connecting hole of the link being larger than the outer diameter of the pipe, and smaller than the outer diameter of the expanded portion, and the expanded portion being pressed against an inner wall of the connecting hole of the link so that the connecting member is secured in the connecting hole of the link.

[0019] The expanded portion is positioned in the connecting hole of the link at an inner position than adjacent the opening of the connecting hole, and the outer diameter of the expanded portion in the connecting hole of the link is larger than the inner diameter of the connecting hole adjacent the opening thereof.

[0020] According to the present invention, there is further provided a method for securely connecting a link and a connecting member in a personal adornment band, wherein the link of the personal adornment band and the connecting member inserted in a connecting hole of the link are connected with each other, comprising, inserting the connecting member in the connecting hole of the link, and outwardly expanding at least a part of the connecting member inserted in the connecting hole at a position in the connecting hole at an inner position than adjacent the opening so as to form an expanded portion having an outer diameter larger than the inner diameter of the connecting hole adjacent the opening thereof, thereby pressing the expanded portion against the inner wall of the connecting hole.

[0021] The connecting pin according to the present invention comprises a shaft inserted in a connecting hole of a link, and a head formed on an end of the shaft, having a larger diameter than the shaft and provided with a slit in an axial direction thereof, and inserted in a connecting hole of another link.

[0022] The link according to the present invention for a personal adornment band comprises a plurality of links rotatably connected to each other by a connecting pin, wherein a ridge extending in the lateral direction of the link and having a semicircular section is formed on one of the longitudinal sides of the link with respect to the band, and a recess corresponding to the ridge having a semicircular section is formed on the other side, so that the ridge and the recess rotatably engage with the recess and the ridge of adjacent links at both sides of the link.

BRIEF DESCRIPTION OF DRAWINGS

[0023]

Fig. 1 is an exploded perspective view of a first embodiment of a personal adornment band according to the present invention;
Fig. 2 is an exploded perspective view of a connecting member in the first embodiment of the present invention;
Fig. 3 is a partially cutaway plan view of the personal adornment band of the first embodiment;
Fig. 4 is an illustration describing relative dimensions of the connecting member;
Fig. 5 is an illustration describing an assembling Step 1 of the personal adornment band;
Fig. 6 is an illustration describing an assembling Step 2 of the personal adornment band;
Fig. 7 is an illustration describing an assembling Step 3 of the personal adornment band;
Fig. 8 is an illustration describing an assembling Step 4 of the personal adornment band;
Fig. 9 is an illustration describing an assembling Step 5 of the personal adornment band;
Fig. 10 is an illustration describing an assembling Step 6 of the personal adornment band;
Fig. 11 is a partial enlarged sectional view of one of the connecting portions shown in Fig. 10;
Fig. 12 is a partial enlarged sectional view of the other connecting portion shown in Fig. 10;
Fig. 13 is an illustration describing an assembling Step 7 of the personal adornment band;
Fig. 14 is a partial enlarged sectional view of one of the connecting portions shown in Fig. 12;
Fig. 15 is a partial enlarged sectional view of the other connecting portion shown in Fig. 12;
Fig. 16 is an illustration describing an assembling Step 8 of the personal adornment band;
Fig. 17 is a partial enlarged sectional view of one of the expanded portions shown in Fig. 16;

Fig. 18 is a partial enlarged sectional view of the other expanded portion shown in Fig. 16;
Fig. 19 is a partially cutaway plan view of a modification of the first embodiment of the present invention;
Fig. 20 is a partially cutaway plan view of a second embodiment of the personal adornment band according to the present invention;
Fig. 21 is an enlarged sectional view showing a part of the expanded portion of the personal adornment band of Fig. 16;
Fig. 22 is a perspective view of a connecting pin in a third embodiment of the present invention;
Fig. 23 is a fragmentary sectional view showing a part of a watchband when links thereof are connected by the connecting pin of Fig. 22;
Fig. 24 is a fragmentary sectional view taken in a longitudinal direction of the watchband of Fig. 23;
Fig. 25 is a fragmentary sectional view showing a part of another watchband when links thereof are connected by the connecting pin of Fig. 22;
Fig. 26 is a fragmentary sectional view showing a part of another watchband when links thereof are connected by the connecting pin of Fig. 22;
Fig. 27 is a perspective view of a buckle connected by the connecting pin of Fig. 22;
Fig. 28 is a fragmentary sectional plan view showing a part of a watchband and a watch when connecting portions thereof are connected by the connecting pin of Fig. 22;
Fig. 29 is a fragmentary sectional plan view showing a part of another watchband and a watch when links thereof are connected by a partially modified connecting pin of Fig. 22;
Fig. 30 is a fragmentary sectional plan view showing a part of another watchband and a watch when links thereof are connected by a partially modified connecting pin of Fig. 22;
Fig. 31 is a plan view of a rod member used for manufacturing the connecting pin of Fig. 22;
Fig. 32 is a sectional view of a metal mold used for manufacturing the connecting pin of Fig. 22;
Fig. 33 is a sectional view showing the rod member of Fig. 31 inserted in a fixed die shown in Fig. 32;
Fig. 34 is a sectional view showing the connecting pin manufactured by pressing the rod member with a movable die shown in Fig. 33;
Fig. 35 is a sectional view showing the rod member of Fig. 31 inserted in another fixed die;
Fig. 36 is a sectional view showing the connecting pin manufactured by pressing the rod member with a movable die shown in Fig. 35;
Fig. 37 is a sectional view showing the rod member of Fig. 31 inserted in another fixed die;
Fig. 38 is a sectional view showing the connecting pin manufactured by pressing the rod member with a movable die shown in Fig. 37;
Fig. 39 is an illustration explaining conditions and scopes for setting elastic force of the connecting pin shown in Fig. 22;
Fig. 40 is an exploded perspective view of a fourth embodiment of the present invention;
Fig. 41 is a sectional plan view;
Fig. 42 is an elevational view;
Figs. 43 and 44 are sectional views;
Fig. 45 is an elevational view;
Fig. 46 is an exploded perspective view of a conventional personal adornment band;
Fig. 47 is a perspective view of a pin provided in the conventional personal adornment band;
Fig. 48 is a partially cutaway plan view showing a structure of a conventional connecting member; and
Fig. 49 is a sectional view of a link.

BEST MODE FOR EMBODYING THE INVENTION

[0024] The first embodiment of the present invention for a personal adornment band represented by a watchband is described hereinafter with reference to Figs. 1 to 19.

[0025] Fig. 1 is an exploded perspective view of the first embodiment of the personal adornment band according to the present invention;

[0026] Fig. 2 is an exploded perspective view of a connecting member in the first embodiment;

[0027] Fig. 3 is a partially cutaway plan view of the personal adornment band;

[0028] Fig. 4 is an illustration describing relative dimensions of the connecting member; and

[0029] Figs. 5 to 19 are illustrations describing the assemblage of the personal adornment band.

[0030] As shown in Figs. 1 to 4, a connecting member 21 according to the present invention comprises a pipe 24 and connecting pins 22 and 23. In particular, in order to connect an end link 26 to another end link 27 which oppose each other in a lateral direction of a watchband 25, two metal connecting pins 22 and 23 are provided.

[0031] The connecting, pin 22 has an elongated cylindrical shaft 22a. The shaft 22a has a cylindrical head 22b

which is larger than the shaft 22a in diameter. Namely, the dimensional relationship between the shaft 22a and the head 22b can be expressed as L < M, where L is the outer diameter of the shaft 22a and M is the outer diameter of the head 22b.

[0032] On the periphery of the head 22b adjacent the shaft 22a, there is provided a taper 22c, thereby forming a circular truncated cone. Namely, the shaft 22a and the head 22b are connected to each other through the gradual slant. A circular truncated conical projection 22d is further provided projecting in a longitudinal direction of the shaft 22a from the free end of the head 22b.

[0033] The other connecting pin 23 has a shaft 23a which is shorter than the shaft 22a of the shaft 22. Similar to the pin 22, the shaft 23 is also provided with a head 23b, taper 23c and a conical projection 23d.

[0034] The connecting pins 22 and 23 can be continuously and inexpensively mass-produced by an automatic cutting machine.

[0035] In addition, there is provided the pipe 24 comprising a hollow metal cylinder. As shown in Fig. 4, the inner diameter N of the pipe 24 is larger than the outer diameters L of the shafts 22a and 23a of the connecting pins 22 and 23, respectively, and smaller than the outer diameters M of the heads 22b and 23b. Namely, there is a relationship of L < N < M.

[0036] The connecting member 21 consists of the connecting pin 22, the connecting pin 23 and the pipe 24.

[0037] End links 26 and 27 have connecting blind holes 28 and 29, respectively, opposing each other in the lateral direction of the watchband 25. The connecting hole 28 is formed in the end link 26 at the inner side thereof and the connecting hole 29 is formed in the end link 27 at the inner side thereof. Since the holes 28 and 29 are formed with a twist drill, bottoms 28b and 29b of the holes each has a conical shape.

[0038] As shown in Fig. 4, the inner diameter Q of each of the connecting holes 28 and 29 is larger than the outer diameter P1 of the pipe 24, and, as will later be described, is smaller than the outer diameter P2 of each of expanded portions 24a, 24b (Fig. 3), which are formed when the heads 22b and 23b of the connecting pins 22 and 23 are depressed into the pipe 24, thereby to expand the pipe 24 in the radial direction thereof. Namely, the relationship of the dimensions are expressed as, P1 < Q < P2.

[0039] A depth R of each of the holes 28 and 29 from an opening 28a to a bottom 28b and from an opening 29a to a bottom 29b is larger than the sum of the length S of each of the heads 22b and 23b of the connecting pins 22 and 23 and the length T of each of the projections 22d and 23b. Namely, there is a relationship of $R > (S + T)$.

[0040] The connecting member 21 is attached to the end links 26, 27 through the following assembling steps. In the explanation, the upper and lower directions refer to upper and lover directions in Figs. 5 to 19.

Step 1

[0041] As shown in Fig. 5, the link 26 is mounted on the upper surface of a supporting block 31 on a table, using an appropriate holding jig (not shown) . The connecting hole 28 of the end link 26 is opened upward. A connecting link 30 is likewise mounted on the end link 26 using an appropriate holding jig (not shown). At that time, a connecting hole 30a penetrating through the connecting link 30 is adapted to coincide with the connecting hole 28. Although the inner diameter of the connecting holes 28 and 30a may be the same, the inner diameter of the connecting hole 30a is preferably larger than that of the hole 28 as shown in the drawing.

Step 2

[0042] As shown in Fig. 6, the pin 22 is next inserted from the upper opening of the connecting hole 30a of the connecting link 30. The connecting pin 22 must be inserted so that the head 22b thereof is at the lower end. The head 22b of the connecting pin 22 is inserted into the connecting hole 28 of the end link 26 and abuts on the bottom 28b. More particularly, the tip end of the projection 22d of the head 22b abuts against the slant of the bottom 28b so that the movement of the pin 22 in the axial direction thereof is prevented.

[0043] Since $R > (S + T)$, the entire length of the head 22b, of the connecting pin 22 is completely held within the connecting hole 28. Furthermore, the end of the shaft 22a of the connecting pin 22 is shown from the opening of the connecting hole 30a. Thus the connecting pin 22 connects the connecting holes 30a and 28.

Step 3

[0044] Referring to Fig. 7, the pipe 24 is then inserted from above through the opening of the connecting hole 30a of the connecting link 30. The shaft 22a of the connecting pin 22 which is already disposed enters the pipe 24. The lower end of the pipe 24 abuts on the taper 22c of the connecting pin 22. The shaft 22a of the connecting pin 22 is completely held within the pipe 24. The free end of the shaft 22a does not project out from the opening at the other end of the pipe 24.

[0045] Since P1 < Q, the pipe 24 is allowed to fluctuate in the radial direction in the connecting hole 30a and 28. Since L < M < Q, the head 22b and the shaft 22a of the connecting pin 22 are allowed to fluctuate in the radial direction (lateral direction in the drawing) in the pipe 24.

Step 4

[0046] Thereafter, the shaft 23a of the connecting pin 23 is inserted in the other end of the pipe 24 which is projected upward as shown in Fig. 8. Since L < M < Q, only the shaft 23a is inserted in the pipe 24 while the head 23b projects out of the pipe 24. At that time, the peripheral edge of the opening at the end of the pipe 24 abuts against the taper 23c.

Step 5

[0047] Referring to Fig. 9, the other end link 27 is then provided. The head 23b of the connecting pin 23 is inserted in the connecting hole 29 of the end link 27. The end link 27 is supported by an appropriate jig (not shown) above the connecting pin 30. Thus the connecting holes 28, 30a and 29 are aligned.

[0048] At that time, it is necessary to provide an ample space A, which is required in the next Step 6, between the free ends of the shafts 22a and 23a in the pipe 24. The length W (see Fig. 4) of the pipe 24 must be long enough so that the shaft 22a and the free end of the shaft 23a do not contact each other.

[0049] In addition, the space A between the free ends of the shafts 22a and 23a is preferably formed adjacent the opening of the connecting hole in the end link 27, and more preferably, positioned slightly outward of the opening 29 of the connecting hole 29.

[0050] Moreover, it is preferable that the end of the pipe 24 is inserted at this step in the connecting hole 29 of the end link 27.

Step 6

[0051] Thereafter, as shown in Fig. 10, a press 32 depresses the end link 27 downward. Thus the end link 27 approaches the link 26.

[0052] As a result, the head 23b of the connecting pin 23 abuts against the bottom 29b of the connecting hole 29 in the end link 27. More particularly, the tip end of the projection 23d of the head 23b abuts on the slant of the bottom 29b so that the axial movement of the connecting pin 23 is prevented. Since R > (S + T) , the entire length of the head 23b of the connecting pin 23 is in the connecting hole 29.

[0053] Referring to Fig. 11, the peripheral edge at one of the ends of the pipe 24 abuts against the taper 22c of the connecting pin 22 at this step.

[0054] As similarly shown in Fig. 12, the peripheral edge at the other end of the pipe 24 abuts against the taper 23c of the connecting pin 23.

Step 7

[0055] As shown in Fig. 13, the press 32 further forces the end link 27 downward so that the end link 27 further approaches the end link 26 in the vertical direction. Thus, since L < N < M, as shown in Fig. 14, the peripheral edge of the opening at the end of the pipe 24 expands along the taper 22c of the connecting portion 22. The peripheral edge at the opening at the other end of the pipe 24 likewise expands along the taper 23c of the connecting pin 23 as shown in Fig. 15.

Step 8

[0056] Referring to Fig. 16, the press 32 then further depresses the connecting link 27 downward. As a result, the head 22b of the connecting pin 22 is forcefully fitted into the pipe 24 from one of the openings thereof. Hence the head 22b of the connecting pin 22 fits in the pipe 24 so as to be engaged therewith.

[0057] As shown in Fig. 17, the periphery of the opening at one end of the pipe 24 covers the outside of the head 22b of the connecting pin 22 while expanding along the taper 22c. Thus there is formed an outwardly expanded portion 24a in the pipe 24 when the head 22b is forcefully fitted therein. Since P1 < Q < P2, the outer periphery of the expanded portion 24a abuts against the inner wall of the connecting hole 28 of the end link 26, thereby engaging with the hole 28.

[0058] The pipe 24 is hence securely mounted in the end link 26 without fail.

[0059] Similarly, the head 23b of the connecting pin 23 is forcefully fitted into the pipe 24 from the other end of the opening thereof. Hence the head 23b of the connecting pin 23 fits in the pipe 24 so as to be engaged therewith.

[0060] As shown in Fig. 18, the periphery of the opening at the other end of the pipe 24 covers the outside of the head 23b of the connecting pin 23 while expanding along the taper 23c. Thus there is formed an outwardly expanded portion 24b in the pipe 24 when the head 23b is forcefully fitted therein. The outer periphery of the expanded portion 24b abuts against the inner wall of the connecting hole 29 of the end link 27, thereby engaging with the hole 29. The pipe 24 is hence securely mounted in the end link 27 without fail.

[0061] Accordingly, the connecting member 21 is securely mounted in the end links 26 and 27. The connecting member 21 bridging the end links 26 and 27 also serves as a rotating shaft of the connecting link 30.

[0062] Meanwhile, as shown in Figs. 3, 17 and 18, it is preferable that each of the expanded portions 24a and 24b is formed at a position inner side of the openings of the corresponding hole 28 or 29 than a position near the opening. In addition, it is preferable that each of the holes 28 and 29 maintain the initial inner diameter Q at the opening.

[0063] Moreover, it is preferable that the expanded portions 24a and 24b are sufficiently expanded in the respective connecting holes 28 and 29 so as to have the outer diameter P2 which is larger than the inner diameter Q of the connecting holes 28 and 29.

[0064] Therefore, the outer diameters of the expanded portion 24a, 24b become larger than the inner diameters of the connecting holes 28, 29 adjacent the openings thereof, so that the expanded portions 24a, 24b never pass through the openings of the connecting holes 28, 29. Thus secure attachments of the connecting member 21 to the end links 26 and 27 are ensured.

[0065] In order to form the expanded portions 24a and 24b at the inner positions than a position near the openings of the respective connecting holes 28 and 29, it is necessary to at least satisfy the relationship $R > (S + T)$.

[0066] Furthermore, in order that the connecting holes 28 and 29 maintain the initial inner diameter Q at the openings thereof, the expanded portions 24a and 24b must never be formed adjacent the openings, not even temporarily.

[0067] Moreover, in the case of the watchband 25, in order that the expanded portions 24a, 24b are sufficiently expanded inside the respective connecting holes 28, 29 so as each to have the outer diameter P2, which is larger than the inner diameter Q, the press 32 must apply at least a vertical load of 60 Kg.

[0068] At that time, the free ends of the shafts 22a and 23a in the pipe 24 are preferably positioned adjacent each other slightly outside of the opening of the connecting hole 29 in the end link 27 with a small distance there-between, which is smaller than the space A.

[0069] Thus, the pipe 24 will not bend even though the end links 26, 27 and the connecting link 30 may be pulled in the opposite directions. Therefore, strength large enough to sustain the longitudinal tension is imparted to the watchband 25.

[0070] In Steps 6 to 8, a portion B (Fig. 13) of the pipe 24 disposed in the space A is not supported neither by the shaft 22a of the connecting pin 22 nor the shaft 23a of the connecting pin 23. Hence there is an apprehension that the portion B may be bent or fractured depending on the depressing force of the press 32.

[0071] However, if the portion B of the pipe 24 is positioned adjacent the opening of the connecting hole 29 of the end link 27 during the Step 5, such a bending and fracture can be avoided, the reason being that the inner wall of the connecting hole 29 supports the pipe 24 so as not to be bent nor fractured.

[0072] Furthermore, provided that the end of the pipe 24 is inserted in the connecting hole 29 of the end link 27 in the Step 5, the pipe 24 is inserted in the connecting hole 29 without fail in the Steps 7 and 8. In addition, the head 23b of the connecting pin 23 is not forcefully fitted in the pipe 24 adjacent the opening of the connecting hole 29.

[0073] The securing force of the end link 26 and 27 of the connecting member 21 is proportional to a difference P2 - Q between the outer diameter of the expanding portion 24a (24b) and the inner diameter of the connecting hole 28 (29). The difference P2 - Q is proportional to a difference M - N between the outer diameter of the head 22b (23b) of the connecting pin 22 (23) and the inner diameter of the pipe 24.

[0074] Furthermore, the securing force between the connecting member 21 and the end link 26 (27) is proportional to the length S in the longitudinal direction of the head 22b (23b) of the connecting pin 22 (23), and more particularly, to the length T of the portion of the head 22b (23b) which is inserted in the pipe 24. When the heads 22b and 23b of the connecting pins 22 and 23 are entirely forcefully fitted into the pipe 24, $S = T$.

[0075] In addition, the load exerted by the press 32 also has an influence.

[0076] If the values of M - N and T are excessively large, the possibility that the portion of the pipe 24 in the space A may bend or break in the aforementioned Steps 6 to 8 increases. To the contrary, if the values are too small, the securing forces of the connecting member 21 to the end links 26 and 27 also become small so that the connecting member 21 falls out of the end links 26 and 27.

[0077] Hence it is desired that the values of M - N and S are set within appropriate ranges.

[0078] In the case of the watchband 25, the value of M is preferably set between 0.50 and 1.50 mm, more preferably between 0.80 to 0.95 mm, and further more preferably between 0.85 and 0.90 mm. The value of N is preferably set between 0.50 and 1.50 mm, more preferably between 0.80 and 0.95 mm, and further more preferably between 0.82 and 0.86 mm. The difference M - N is preferably set between 0.10 and 0.80 mm, more preferably between 0.20 and 0.60, and most preferably 0.4 mm.

[0079] Additionally, the value T in the watchband is preferably set between 0.20 and 1.00 mm, more preferably between 0.40 and 0.80 mm, and most preferably 0.6 mm.

[0080] Various modifications and additions may be made to the above described embodiment by those skilled in the art.

[0081] For example, the outer diameters of the heads 22b, 23b provided on the connecting pins 22 and 23, respectively, are both set at the value M. However, the outer diameters may differ within a range wherein a stable securing force is provided. The same can be said for the outer diameters L of the shafts 22a, 23a and the longitudinal lengths S of the shaft of the heads 22b, 23b. The inner diameters Q of the connecting holes 28 and 29 of the respective end links 26 and 27 need not be equal to each other.

[0082] A part of each of the heads 22b, 23b of the connecting pins 22 and 23 may be forcefully fitted in the pipe 24. In such a case, $S > T$.

[0083] The projections 22d and 23d formed on the heads 22b and 23b of the connecting pins 22 and 23 may be obviated.

[0084] Furthermore, the number of the connecting link 30 need not be limited to one. As shown in Fig. 19, two connecting links 30A and 30B may be connected in upper and lower rows in parallel by the connecting member 21. A large number of connecting links may further be used.

[0085] During the assemblage, various assembling methods other than the steps described above can be considered for reaching the state obtained at the Step 5.

[0086] For example, the connecting pin 23 is inserted in the end link 26 and the connecting link 30 beforehand, and the connecting pin 22 may be inserted in the pipe 24 thereafter.

[0087] Alternatively, the pipe 24 and the connecting pins 22 and 23 may be assembled beforehand. Namely, the shaft 22a of the connecting pin 22 and the shaft 23a of the connecting pin 23 are inserted from the openings of the pipe 24 at the ends so as to oppose each other while the heads 22b and 23b thereof are projected out from the pipe 24. It is advantageous to slightly push the connecting pins 22 and 23 into the pipe 24 so that the tapers 22c and 23c lightly contact the peripheral edges of the openings of the pipe 24. The pins 22 and 23 are thus prevented from falling out from the pipe 24.

[0088] The second embodiment of the present invention is described with reference to Figs. 20 and 21.

[0089] Fig. 20 is a partially cutaway plan view of the second embodiment of the personal adornment band according to the present invention, and Fig. 21 is an enlarged sectional view showing a part of an expanded portion of the personal adornment band of Fig. 20. The constructions in the second embodiment which are the same as those in the first embodiment are designated by the same reference numerals and the detailed descriptions thereof are omitted, explaining only the differences.

[0090] As shown in the drawings, the connecting member 21 in the second embodiment differs from that of the first embodiment in the lengths of connecting pins 32 and 33.

[0091] Namely, the connecting pin 32 is short. The entire length U in the longitudinal direction of a shaft 32a of the connecting pin 32 is shorter than the depth R of the connecting hole 28 from the opening 28a to the innermost portion at the bottom 28b. The relationship is expressed as $U < R$.

[0092] Accordingly, the length of the connecting pin 33 is formed longer corresponding to the length shortened in the connecting pin 32. The entire longitudinal length of a shaft 33a of the connecting pin 33 is equal to the length of the sum of the lengths of the connecting pins 22 and 23 of the connecting member 21 in the first embodiment subtracted by the entire length U of the connecting pin 32. As can be seen in Fig. 20, the entire length of the connecting pin 33 is long enough to bridge the end links 26 and 27 by way of the connecting link 30.

[0093] The connecting member 21 and the end links 26 and 27 are assembled through the same steps as those of the first embodiment so as to be securely connected.

[0094] Hence as shown in Fig. 21, the connecting pin 33 is inserted in the connecting hole 28 of the end link 26. Thus the danger of the connecting member 21 bending or fracturing is obviated.

[0095] In accordance with the first and second embodiments, the securing means for connecting the end links and the connecting member provides a strong and stable securing force due to the force fitting of the pipe, and the fitting does not weaken. Accordingly, there is provided a personal adornment band in which the connecting member and the end links are not disengaged from one another.

[0096] Fig. 22 is a perspective view showing a structure of a connecting pin according to the third embodiment of the present invention. A connecting pin 42 comprises a machined rod member having a shaft 42a and a head 42b at an end thereof. The shaft 42a is a cylindrical rigid member having a taper 42c tapered toward an end surface 42d so as to facilitate the insertion at the end (the left end in the drawing). The head 42b has a diameter larger than that of the shaft 42a, and an end surface 42e thereof is provided with an axial slit 42f at the center thereof. The outer periphery of the head 42b has an abutting surface 42g at a substantially center portion which abuts on the inner surface of the connecting hole of the link, a taper 42h between the abutting surface 42g and the shaft 42a for facilitating the insertion, and a taper 42i formed around the periphery of the end surface 42e for facilitating the removal of the shaft out of the con-

necting hole. The head 42b has a diameter slightly larger than that of the connecting hole 36d (Fig. 23) of the link. As shown in the drawing, the slit 42f is formed not only in the head 42b but also in the shaft 42a.

[0097] The connection of the links of a watchband using the connecting pin 42 shown in Fig. 22 is described hereinafter with reference to Figs. 23 to 26. A watchband 34 shown in Figs. 23 and 24 comprises end links 36 and connecting links 38. Each of the connecting links 38 is a rectangular ring as shown in Fig. 24. A connecting plate 36c is attached between the end links 36, and the connecting link 38 is provided so as to surround the connecting plate 36c. In the watchband, in order to connect the connecting link 38 with the adjacent end links 36 with the connecting pin 42, the links 36 are positioned so as to communicate connecting holes 36d and 36e of the end links 36 with the connecting hole 38a of the connecting link 38, and the connecting pin 42 is inserted in the connecting holes 36d, 36e and 38a. At that time, the connecting pin 42 is inserted into the connecting holes 36d, 36e and 38a from the end of the shaft 42a having the end surface 42d so that the tip of the shaft 42a and the tapers 42c and 42h of the head 42b are not caught by the openings of the connecting holes 36d, 36e and 38a.

[0098] Since the head 42b of the connecting pin 42 has a larger diameter than the connecting hole 36d, the pin 42 is radially compressed and forced into the connecting hole 36d. The head 42b, due to the elasticity thereof, presses the abutting surface 42g against the inner wall of the connecting hole 36d, so that the connecting pin 42 in the connecting holes 36d, 36e and 38a is held therein and secured. Since the diameter of the shaft 42a is smaller than the connecting hole 38a, the connecting link 38 is rotatably supported with respect to the shaft 42a.

[0099] When the connecting link 38 and the end links 36 are thus connected to each other by the connecting pin 42, the shaft 42a of the connecting pin 42 having a large strength supports the connecting link 38 and the links 36. Hence the connecting pin 42 is prevented from deforming when a tension in the longitudinal direction of the band is exerted, thereby providing a strong connection.

[0100] In order to remove the connecting pin 42 for adjusting the length of the band, the end surface 42d of the connecting pin 42 is pushed by a tool, thereby ejecting the head 42b out from the connecting hole 36d to pull out the connecting pin.

[0101] A watchband 44 shown in Fig. 25 comprises the above described end links 36 and a pair of narrow connecting links 46 and 48 are disposed in the lateral direction of the band. In the case of the thus constructed watchband 44, respective connecting holes 46a and 48a of the connecting links 46 and 48 are aligned with the connecting holes 36d and 36e of the end links 36 and the connecting pin 42 is inserted in the holes so as to connect the links.

[0102] A watchband 54 shown in Fig. 26 comprises a plurality of links 56 each having a pair of connecting lugs 56a and 56b projecting from one of the sides of the link, and a lug 56c projecting front the other side of the link. In order to connect the links, the lug 56c of one of the links 56 is inserted between the lugs 56a and 56b of the adjacent link 56. At that time, connecting holes 56d and 56e formed in the lugs 56a and 56b, respectively, are communicated with the connecting hole 56f in the lug 56c of the adjacent link 56. The connecting pin 42 is inserted in the connecting holes 56d, 56e and 56f so that the adjacent links 56 are connected with each other.

[0103] Not only can the connecting pin 42 be used in watchbands having various structures and shapes as described above, the pin can also be used for connecting parts of a buckle.

[0104] For example, referring to Fig. 27, a triple-fold buckle 60 comprises an upper cover 62, middle plate 64 and a bottom plate 66. In the buckle, a part connecting a link 68 at the end of a band with the upper cover 62, a part connecting the upper cover 62 with the middle plate 64, a part connecting the middle plate 64 with the bottom plate 66, and a part connecting the bottom plate 66 with a link 70 at the other end of the band may each be connected using the connecting pin 42. Namely, connecting holes 62c, 62d formed in respective side walls 62a and 62b of the upper cover 62 are communicated with connecting holes 68a and 68b, respectively, in the link 68, and the connecting pin 42 is inserted therein. Other connecting holes 62e and 62f formed in the respective side walls 62a and 62b and connecting holes 64c and 64d in respective cylindrical portions 64a and 64b at an end of the middle plate 64 are communicated with each other, and the connecting pin 42 is inserted therein. A connecting hole 64f in a cylindrical portion 64e formed at the other end of the middle plate 64 and connecting holes 66c, 66d formed in respective cylindrical, portions 66a, 66b at one end of the bottom plate 66 are communicated with each other and the connecting pin 42 is inserted therein. In addition, connecting holes 66g, 66h formed in respective cylindrical portions 66e, 66f at the other end of the bottom plate 66 are communicated with a connecting hole 70a of the link 70, and the connecting pin 42 is inserted therein.

[0105] In each of the above described connecting parts, the shaft 42a of the connecting pin 42 has a diameter smaller than those of the connecting holes so as to rotatably support each parts. The head 42b, the diameter of which is larger than those of the connecting holes, abuts against the inner wall of each connecting hole due to the elasticity.

[0106] Fig. 28 shows an example wherein the connecting pin is used for connecting a watchband to a watch.

[0107] As shown in the drawing, a band 74 made of such material as leather and rubber is inserted in a space between connecting lugs 72a and 72b of a watch 72, and the connecting pin 42 is inserted in a connecting hole 74a at an end of the band 74 and connecting holes 72c, 72d formed in the lugs 72a, 72b.

[0108] Referring to Fig. 29, in the case where a metal band 78 is connected to a connecting portion 76a projecting from a watchcase 76, a connecting hole 76b of the connecting portion 76a is communicated with connecting holes 78b,

78c of a link 78a. The connecting pin 42 is inserted in the holes.

[0109] The connecting pins used in the links of a watchband at portions where the length of the band need not be adjusted, in a band of a diver's watch, which is used under severe conditions, and in buckles, are required to ensure the connection and not to easily fall out.

[0110] Fig. 29 shows such a connecting pin. As shown in the drawing, a connecting pin 42A has heads 42b at both ends of the shaft 42a. The heads 42b each has the same construction as the head 42b of the pin 42 shown in Fig. 22 and is provided with the slit so as to be imparted with elasticity in the radial direction.

[0111] When links are connected using the connecting pin 42A provided with heads 42b at both ends, as shown in Fig. 29, heads 42b are pressed against the inner walls of connecting holes 78b and 78c of a pair of connecting links 78a which interposes a center connecting link 78d there-between from both lateral sides. In order to pull out the pin, twice as much force as the pin 42 with one head 42b is needed. Although one of the links 78 may slip off from the head 42b, the link 78 does not fall off unless the other head 42b passes through the opening 78e of the connecting link 78d. Thus the link cannot fall off unless removed with a tool.

[0112] Moreover, when using the connecting pin 42A with heads 42b at both ends thereof, the connecting hole in the link 78a may be a blind hole such as blind holes 78f, 78g shown in Fig. 30, instead of the holes 78b, 78c shown in Fig. 29 which penetrate through the link 78a. By rendering the holes the blind holes, the connecting holes 78f, 78g and the heads 42b of the connecting pin 42A are not exposed on the sides of the band so that the appearance of the band is improved. In addition, the surface of the wrist is prevented from getting caught at the edge of the opening of each hole of the sides of the band so that the band is more comfortably worn.

[0113] The method for manufacturing the connecting pin 42 is next described. In the present embodiment, a rod member 80 shown in Fig. 31 is forged using a fixed die 82 and a movable die 84 shown in Fig. 32 to form the outer shape of the connecting pin 42. The rod member 80 is a cylindrical rod made of metal such as stainless steel. The fixed die 82 has a shaft forming portion 82a for forming the outer shape of the shaft 42a of the connecting pin 42, shaft end surface forming portion 82d for forming the end surface 42d (Fig. 22) of the shaft 42a, shaft taper forming portion 82c for forming the taper 42c of the shaft 42a, and a head taper forming portion 82h for forming the taper 42h on the head 42b. The shaft end surface forming portion 82d is formed as an end surface of a stopper 86 provided in the fixed die 82. The movable die 84 has an inner diameter larger than the inner diameter of the forming portion 82a and is provided with an abutting surface forming portion 84g, head end surface forming portion 84e, and head taper forming portion 84i for respectively forming the abutting surface 42g, end surface 42e and the taper 42i.

[0114] As shown in Fig. 33, the rod member 80 is first of all inserted in the fixed die 82. The rod member 80 is then applied with pressure from the movable die 84 in the direction shown by an arrow 88 in Fig. 34 so that the rod member 80 is shaped into the form of the connecting pin 42. The thus forged connecting pin 42 preferably undergoes an abrasive treatment such as barrel polishing. The abrasion removes flashes and strains formed on the connecting pin 42 during the forging process so that the outer surface of the connecting pin 42 becomes smooth. Hence not only the appearance of the connecting pin 42 is improved, the connecting pin 42 is prevented from being caught by the inner wall of the connecting holes so that the connecting pin 42 is smoothly inserted in the holes. Thereafter, the pin is machined so as to form the slit 42f in the head 42b.

[0115] The above described fixed die 82 and the movable die 84 substantially separately forms the shaft 42a and the head 42b to form the outer shape of the pin 42. However, as shown in Figs. 35 and 36, a large portion of the pin 42 may be formed by the fixed die 82. Namely the fixed die 82 is provided with the shaft forming portion 82a, shaft end surface forming portion 82d, shaft taper forming portion 82c, an abutting surface forming portion 82g and a head taper forming portion 82h for respectively forming the shaft 42a of the connecting pin 42, the end surface 42d and the taper 42c of the shaft 42a, the abutting surface 42g of the head 42b, and the taper 42h of the head 42b. The movable die 84 is provided with the head end surface forming portion 84e and the head taper forming portion for respectively forming the end surface 44e and the taper 44i on the head 42b of the connecting pin 42.

[0116] Furthermore, as shown in Figs. 37 and 38, the head taper forming portion 84i in the movable die 84 shown in Fig. 34 may be obviated so as to form only the head end surface forming portion 84e having a flat surface. When the outer shape of the connecting pin 42 is formed using the fixed die 84 and movable die 82 of Figs. 37 and 38, the dimensions thereof become most stable.

[0117] The structures of the fixed dies 82 and the movable dies 84 shown in Figs. 32 to 38 may be inverted so that the fixed die 82 is rendered movable and the movable die 84 fixed.

[0118] If the rod member 80 is applied with pressure in the axial direction thereof as described above, thereby to form the outer shape of the connecting pin, the hardness is improved. For example, if a material SUS304 having the hardness of HV230 is used as the rod member 80, the hardness of the connecting pin 42 is increased to about HV440.

[0119] Since the hardness is thus increased, the strength of the shaft 42a against a lateral force which is exerted in the radial direction thereof is largely increased. For example, Table 1 shows the comparison made between the lateral strengths in the connecting pin 42 of the present invention and in the conventional hairpin connecting member 4 of the same material.

Table 1

Number of Pressing	Connecting Pin 42		Connecting Member 4	
	Restorable Pressure Kg	Deforming Pressure Kg	Restorable Pressure Kg	Deforming Pressure Kg
1	6.5	9.0	1.5	3.0
2	6.5	8.5	2.0	3.0
3	6.5	9.0	2.0	2.5
4	5.5	9.0	2.0	2.5
5	5.5	8.5	2.0	2.5

[0120] As shown in the Table 1, the strength of the connecting pin 42 against the lateral force is substantially twice to three times as large as that of the connecting member 4.

[0121] The connecting pin manufactured by machining by an automatic lathe and the connecting pin manufactured by forging can be easily distinguished from each other by the appearances thereof. Namely, on the outer surface of the machined connecting pin, there remain traces of machining such as scratches. On the other hand, the outer surface of the forged connecting pin has none of such scratches, expect at the portion adjacent the slit. In particular, if barrel polishing is performed in the forged connecting pin as hereinbefore described, the outer surface of the connecting pin becomes significantly smooth so that the two can further be clearly distinguished.

[0122] In the connecting pin 42 the outer surface of which is thus formed by forging, the axial slit 42f is formed in the head 42b thereof. The dimension of the slit 42f determines the level of the elasticity which forces the outer periphery of the head 42b and the abutting surface 42g against the inner wall of the holes. It is preferable to set the dimensions of the parts designated by the references shown in Fig. 39 under the following conditions and in the following ranges.

[0123] In Fig. 39, the outer diameter of the head 42b is represented by L, width of the slit 42f is M, depth of the slit 42f is N, inner diameter of a connecting hole 92 formed in a link 90 is K, and the axial length of the abutting surface 42g which determine the area of the abutting surface 42g against the inner wall of the connecting hole 92 is P. The elastically deforming quantity of the head 42b in the radial direction is determined in accordance with L - K. The strength of the elasticity which forces the abutting surface 42g to contact the inner surface of the connecting hole 92 is determined in accordance with L - M and N. The abutting area of the abutting surface 42g is determined in accordance with P. Namely, as the outer diameter L is set larger, the elastically deforming quantity is increased so that that connecting pin 42 becomes more difficult to fall out of the connecting hole 92. The larger the values L - M and N, the larger the elasticity so that the connecting pin 42 similarly becomes difficult to fall out. In addition, the larger the axial length P, the larger becomes the abutting area of the abutting surface 42g so that the connecting pin 42 similarly becomes difficult to fall out. However, if the abutting force of the connecting pin 42 against the connecting hole 92 is excessively increased, the head 42b may be plastically deformed. On the other hand, when the values L - K, L - M, N and P are excessively small, the abutting force of the connecting pin 42 against the connecting hole 92 becomes too small, so that the connecting pin 42 unexpectedly falls out from the connecting hole 92. Thus the values L - K, L - M, N and P are preferably determined within predetermined ranges.

[0124] The above described elastically deforming quantity L - K is set preferably between 0.6 and 0.05 mm. More particularly, if the deforming quantity is to be set large, the value is set between 0.6 and 0.4 mm, and if to be set small, the value is set between 0.2 and 0.05 mm.

[0125] The value L - M which determines the strength of the elasticity is preferably set between 4.0 and 0.3 mm. More particularly, if the elasticity is to be set large, the value is set between 0.6 and 0.4 mm, and if to be set small, the value is set between 1.0 and 0.3 mm.

[0126] The value N which determines the strength of the elasticity is preferably set between 5.0 and 0.3 mm. More particularly, if the elasticity is to be set large, the value is set between 6.0 and 4.0 mm, and if to be set small, the value is set between 1.5 and 0.3 mm.

[0127] Moreover, the value P which determines the abutting area of the abutting surface 42g is preferably set between 6.0 and 0.2 mm. More particularly, if the abutting force is to be large, the value is set between 6.0 and 4.0 mm, and if to be small, the value is set between 2.0 and 0.2 mm.

[0128] The strength is accordingly increased, and moreover, the connecting pin 42 the elasticity of which is appropriately set, can be repeatedly inserted in and drawn out of the connecting hole without largely losing the elasticity of the head 42b. Table 2 shows an example of the change in the drawing force of the connecting pin when repeatedly

inserted in and drawn out of a connecting hole of a watchband.

Table 2

Number of Repetition	Drawing Force Kg
1	3.0
2	2.8
3	2.2
4	2.3
5	2.2
6	2.1
7	2.0
8	2.0
9	2.3
10	2.0

[0129] As shown in Table 2, the change in the drawing force is only very slight and it is confirmed that the repeated inserting and drawing out does not cause the head 42b to lose the elasticity thereof.

[0130] In accordance with the third embodiment of the present invention, the shaft, to which an external force is exerted the most, is formed with a rigid body. In addition, the head is imparted with a strong elasticity necessary at securing so that the structure of the pin is strengthened, thereby preventing deformation and fracture from occurring.

[0131] Moreover, since the connecting pin having the above described structure is forged, the hardness thereof can be improved, so that the strength is extremely high, and the elasticity is increased. Thus there is provided a connecting pin, the elasticity of which is not decreased despite the repeated insertion and removal.

[0132] Furthermore, since the connecting pin is forged, the productivity of the pin is increased five times more than when manufactured with an automatic lathe. Hence the manufacturing cost is decreased.

[0133] A watchband of the fourth embodiment of the present invention is described with reference to Figs. 40 to 45. The watchband comprises an outer end links 101 and 102 and inner connecting links 103a and 103b. Each end link has a hole 104 similar to the connecting hole 36 in the third embodiment and a blind connecting hole 105 similar to the connecting hole 28 in the first embodiment.

[0134] Meanwhile, connecting holes 106 and 107 are formed in each of the connecting links 103a and 103b.

[0135] A ridge 108 having a semicircular section extending in a lateral direction of the band is formed at a longitudinal side of the connecting link 103a at the center portion. On the opposite side, there is formed a recess 109 having a semicircular section, in which the ridge 108 of the adjacent link 103b is rotatably engaged.

[0136] The end links 101, 102 and the connecting link 103a is connected to each other by a connecting member 110 similar to that of the first embodiment. In such a case, a pipe 111 of the connecting member 110 is forcefully fitted into the connecting holes 105 and 107, thereby attaching the end links 101, 102 and the connecting link 103a.

[0137] The ridge 108 of the adjacent connecting link 103b is then engaged with the recess 109 of the connecting link 103a. A connecting pin 112 which is the same as the connecting pin 42 in the third embodiment is inserted in the connecting holes 104 of the end links 101 and 102 and the connecting hole 106 of the connecting link 103b. A head 112b of the pin abuts against the inner wall of the hole 104 so that a shaft 112a is engaged with the hole 106 with allowance. The connecting link 103b is thus rotatably connected to the connecting link 103a.

[0138] The links are likewise connected to one another so as to form the watchband.

[0139] The adjacent connecting links 103a and 103b are connected to each other by the engagement of the semicircular ridge 108 and recess 109, thereby enabling to smoothly pivot as shown in Fig. 45. Due to the engagement of the ridge and the recess extending in the lateral direction of the band, the twisting of the links about a longitudinal axis of the band is prevented so that the disengagement of the connecting pin can be prevented.

[0140] In accordance with the fourth embodiment, the twisting of the link is restrained so that the connecting pin is prevented from abutting against the inner wall of the hole, which may cause the disengagement of the pin. In addition, since the entire band smoothly bends along the wrist so that the band is comfortably worn. Moreover, if the band has the end links, the recesses and the ridges are concealed by the end links so that the appearance of the band is not impaired.

PROBABILITY OF INDUSTRIAL EXPLOITATION

[0141] In accordance with the present invention, the securing means by the end links and connecting member provides a strong and stable securing force due to the force fitting of the pipe, so that the abutting force of the connecting member against the holes of the end links is not deteriorated. Therefore, there is provided a personal adornment band where the connecting member and the end link are not disengaged.

[0142] Moreover, the shaft, to which an external force is exerted the most, is formed with a rigid body, and the head is imparted with a particularly strong elasticity necessary for securing so that the structure of the pin is strengthened, thereby preventing deformation and fracture from occurring.

[0143] Moreover, since the connecting pin having the above described structure is forged, the hardness thereof can be improved, so that the strength is extremely high, and the elasticity is increased. Thus there is provided a connecting pin, the elasticity of which is not decreased despite the repeated insertion and removal.

[0144] Furthermore, since the connecting pin is forged, the productivity of the pin is increased five times more than when manufactured with an automatic lathe. Hence the manufacturing cost is decreased.

Claims

1. A structure for connecting a link and a connecting member in a personal adornment band, wherein the connecting member is inserted in a connecting hole formed in the link, which comprises:

   the connecting member comprising a pipe and a connecting pin;
   the connecting pin having a shaft and a head having an outer diameter larger than the outer diameter of the shaft;
   the head of the connecting pin being forcefully fitted in the pipe so that the pipe is expanded to form an expanded portion in the radial direction thereof;
   the inner diameter of the connecting hole of the link being lager than the outer diameter of the pipe, and smaller than the outer diameter of the expanded portion; and
   the expanded portion being pressed against an inner wall of the connecting hole of the link so that the connecting member is secured in the connecting hole of the link.

2. The structure according to claim 1 wherein the expanded portion is positioned in the connecting hole of the link at an inner position than adjacent the opening of the connecting hole, and the outer diameter of the expanded portion in the connecting hole of the link is lager than the inner diameter of the connecting hole adjacent the opening thereof.

3. The structure according to claim 1 wherein a portion of the pipe projecting out of the link is supported by a shaft of the connecting pin.

4. The structure according to claim 1 wherein a taper connected with the shaft is formed on the head of the connecting pin adjacent the shaft.

5. The structure according to claim 1 wherein the connecting member comprises a pipe and a pair of opposite connecting pins inserted in the pipe;

   the heads of the connecting pins are forcefully fitted into the pipe so as to form a pair of expanded portions;
   the links opposed in the lateral direction of the personal adornment band each has a connecting hole; and
   each of the expanded portions is pressed against inner wall of the connecting hole of the corresponding link.

6. The structure according to claim 5 wherein the shaft of one of the connecting pins is in contact with the shaft of the other connecting pin at the ends thereof.

7. The structure according to claim 5 wherein the shaft of one of the connecting pins opposes the shaft of the other connecting pin at a position adjacent the connecting hole of the link.

8. The structure according to claim 7 wherein, the connecting pin secured in the connecting hole of one of the links has a length long enough to reach a position adjacent the connecting hole of the other link.

9. A method for securely connecting a link and a connecting member in a personal adornment band, wherein the link

of the personal adornment band and the connecting member inserted in a connecting hole of the link are connected with each other, comprising:

inserting the connecting member in the connecting hole of the link; and
outwardly expanding at least a part of the connecting member inserted in the connecting hole at a position in the connecting hole at an inner position than adjacent the opening so as to form an expanded portion having an outer diameter larger than the inner diameter of the connecting hole adjacent the opening thereof, thereby pressing the expanded portion against the inner wall of the connecting hole.

10. A wristwatch including a watchband having the connecting structure according to claim 1.

11. A connecting pin comprising:

a shaft inserted in a connecting hole of a link; and
a head formed on an end of the shaft, having a larger diameter than the shaft and provided with a slit in an axial direction thereof, and inserted in a connecting hole of another link.

12. The connecting pin according to claim 11 wherein the head is formed at each end of the shaft.

13. The connecting pin according to claim 11 wherein a taper is formed between the shaft and the head.

14. A method for manufacturing a connecting pin wherein a metal rod member is inserted in a fixed die and applied with pressure in the axial direction thereof by a movable die, thereby forming a shaft capable of being inserted in a connecting hole of a link, and a head at the end of the shaft, having a larger diameter than the shaft, by a large inner diameter portion formed in one of the dies.

15. A link of a personal adornment band comprising a plurality of links rotatably connected to each other by a connecting pin, wherein a ridge extending in the lateral direction of the link and having a semicircular section is formed on one of the longitudinal sides of the link with respect to the band, and a recess corresponding to the ridge having a semicircular section is formed on the other side, so that the ridge and the recess rotatably engage with the recess and the ridge of adjacent links at both sides of the link.

16. A link of the personal adornment band according to claim 15 wherein the link of the personal adornment band comprises a connecting link disposed at the center, and end links at both sides of the connecting link, the ridge and the recess formed on the connecting link, and the edges of the ridge and the recess concealed by the end links.

FIG. 1

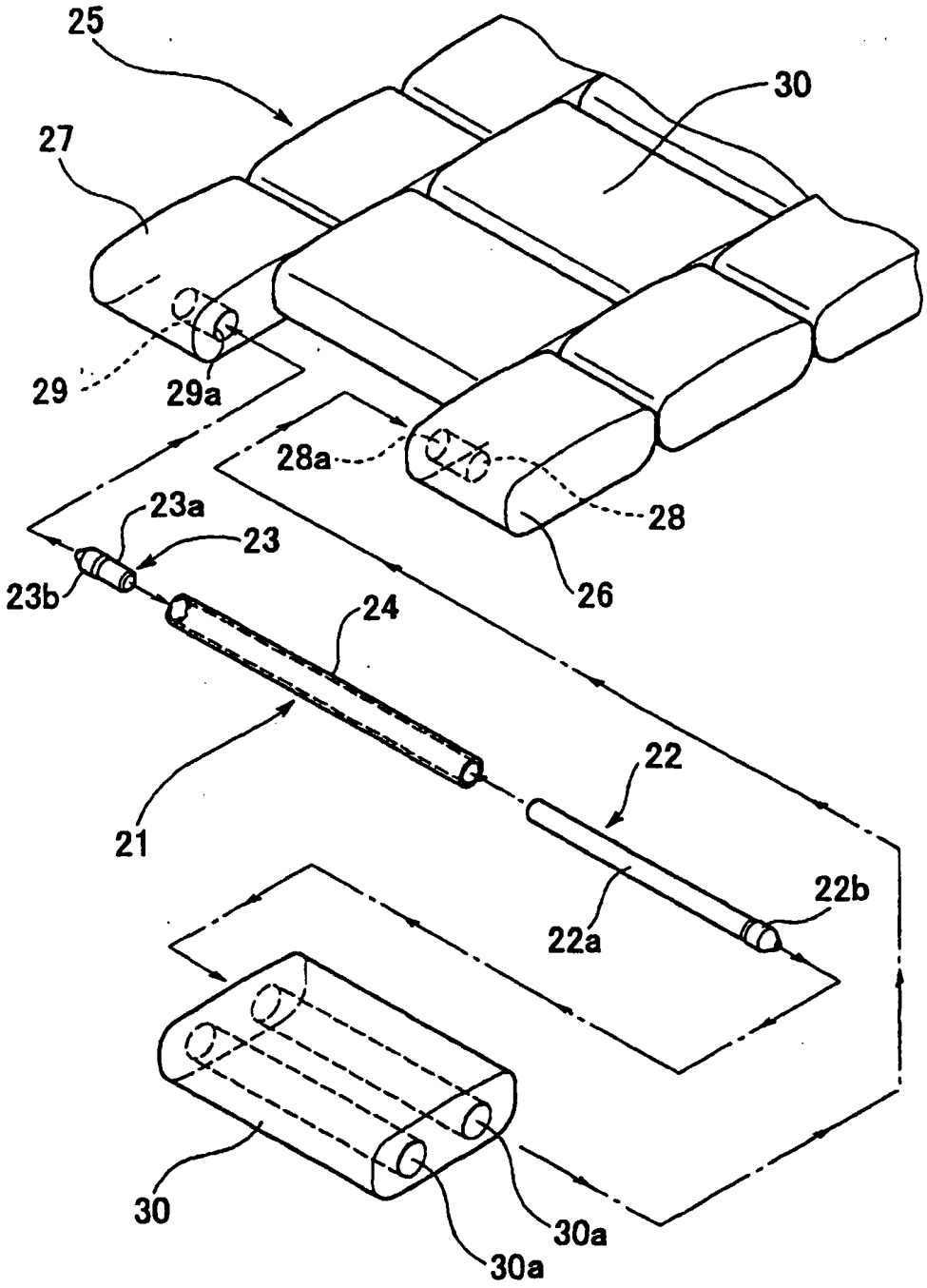


FIG. 2

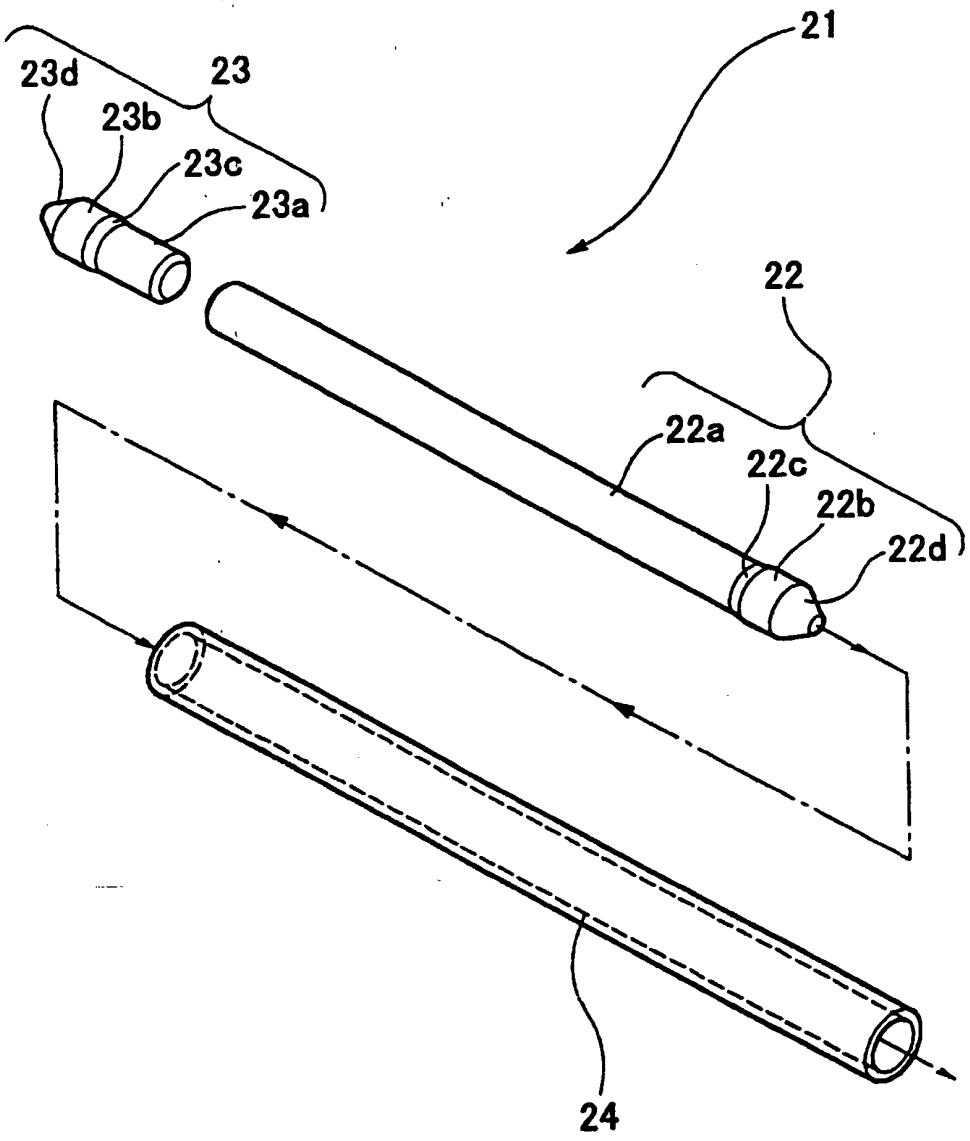


FIG. 3

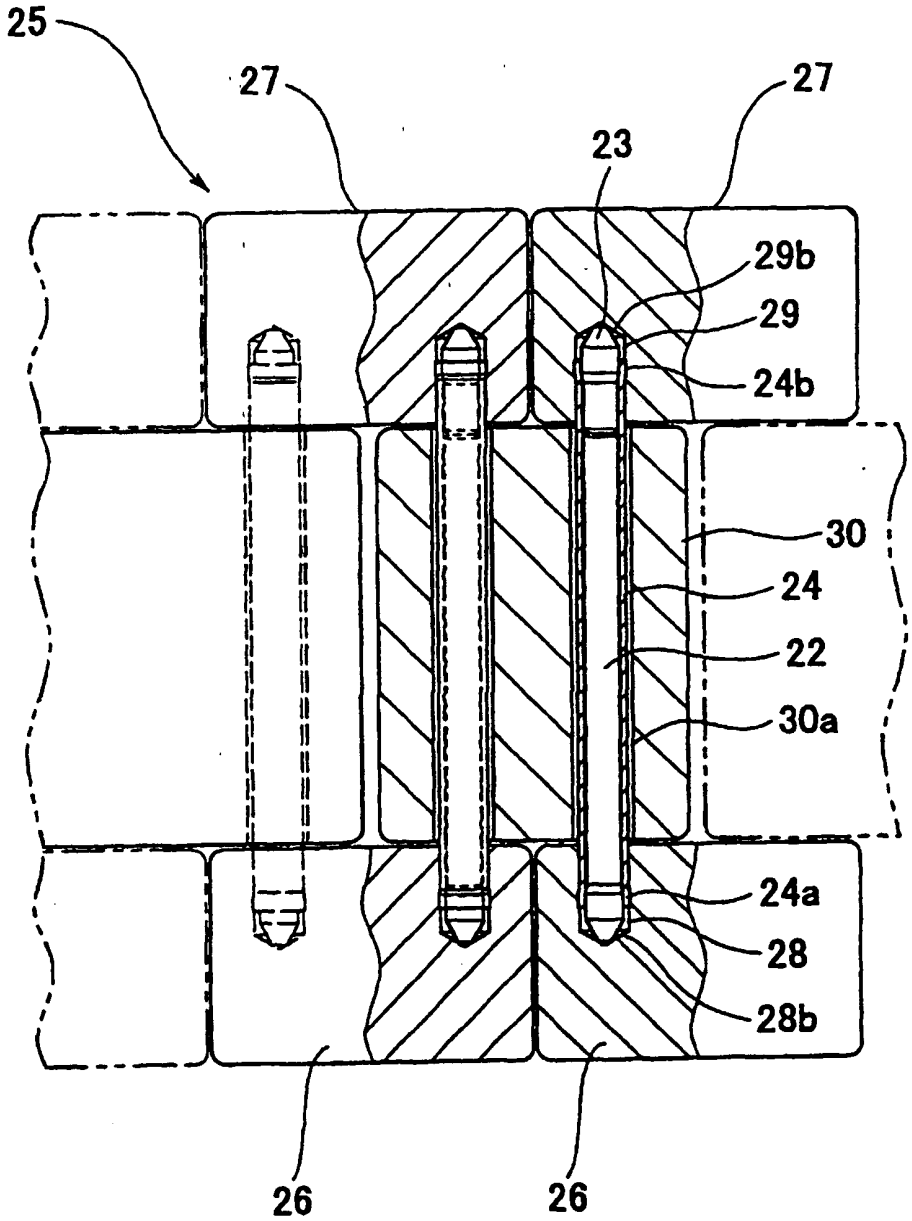
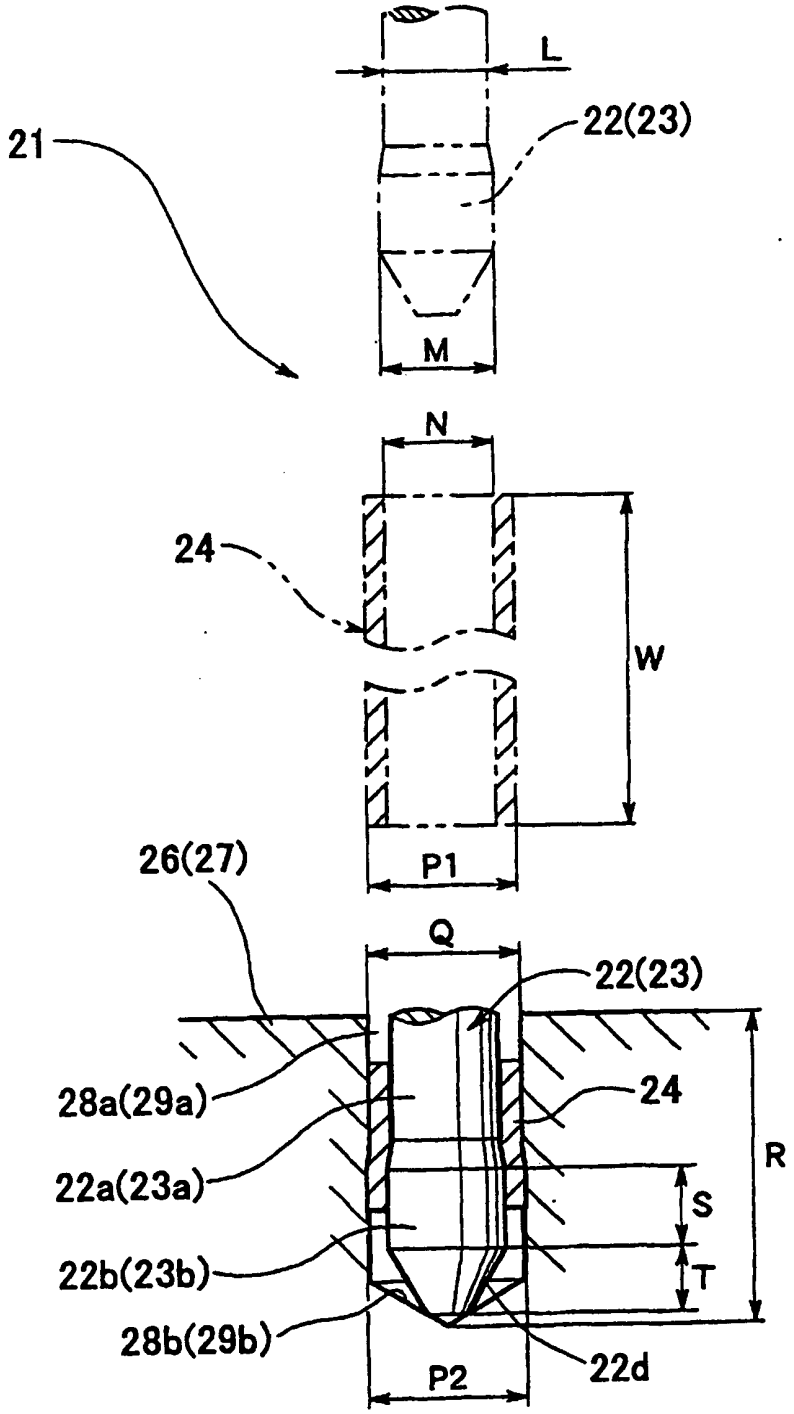


FIG. 4


L
21
22(23)
M
N
24
W
P1
26(27)
Q
22(23)
28a(29a)
24
22a(23a)
R
S
22b(23b)
T
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22d
P2

FIG. 5

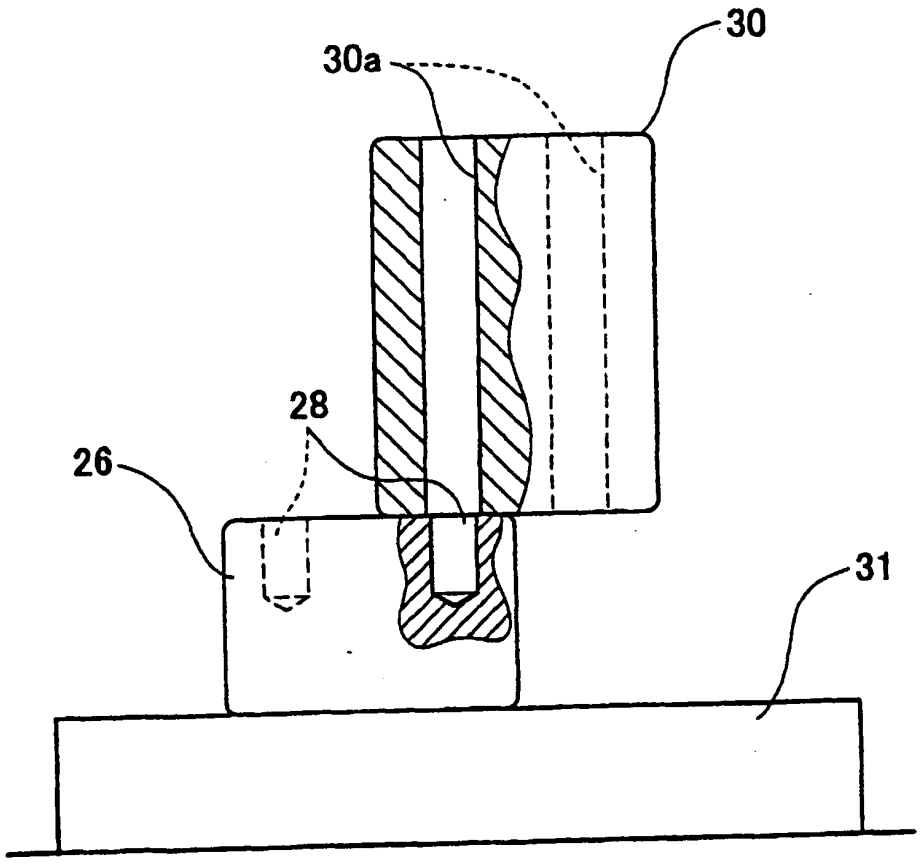

FIG. 6

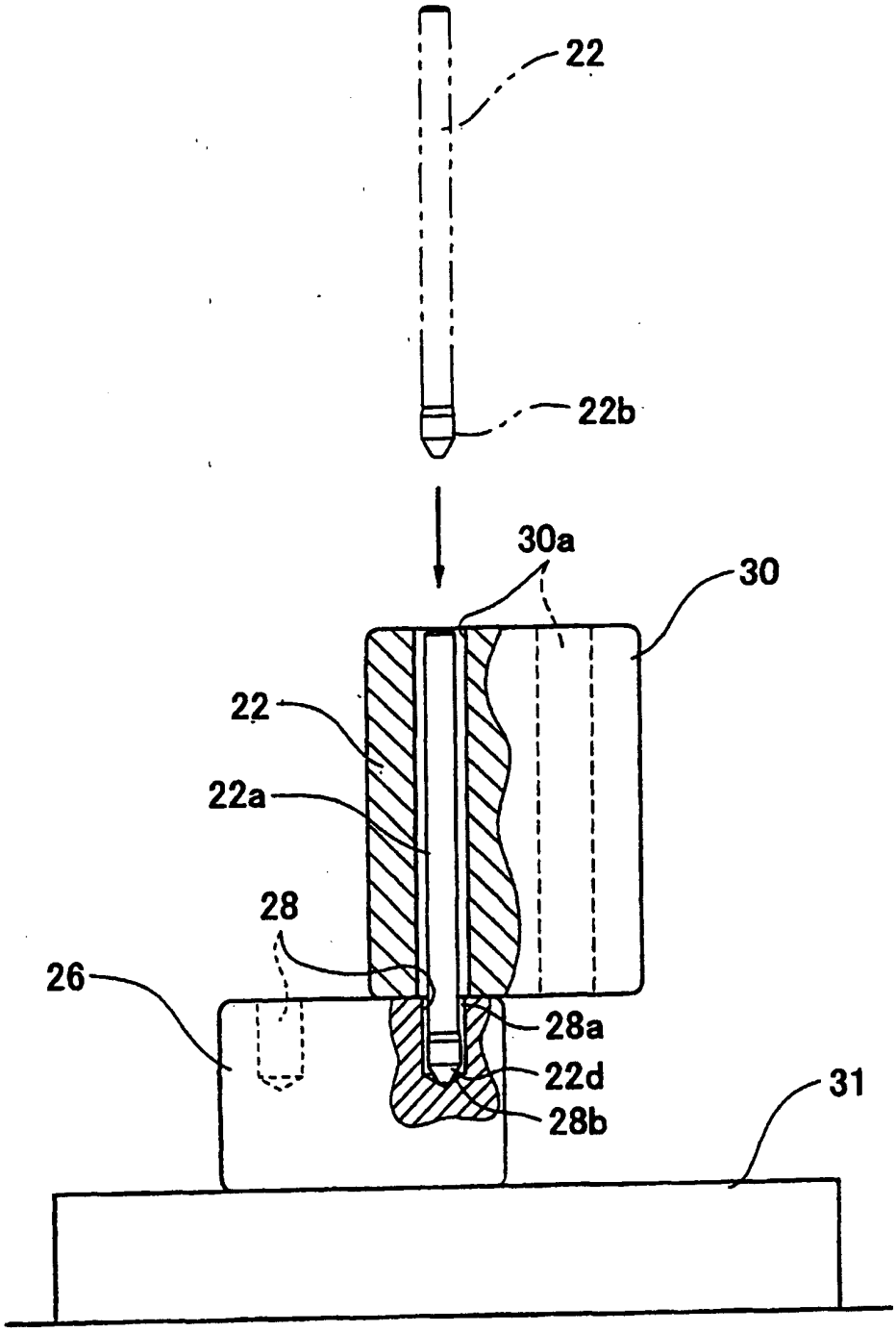

FIG. 7

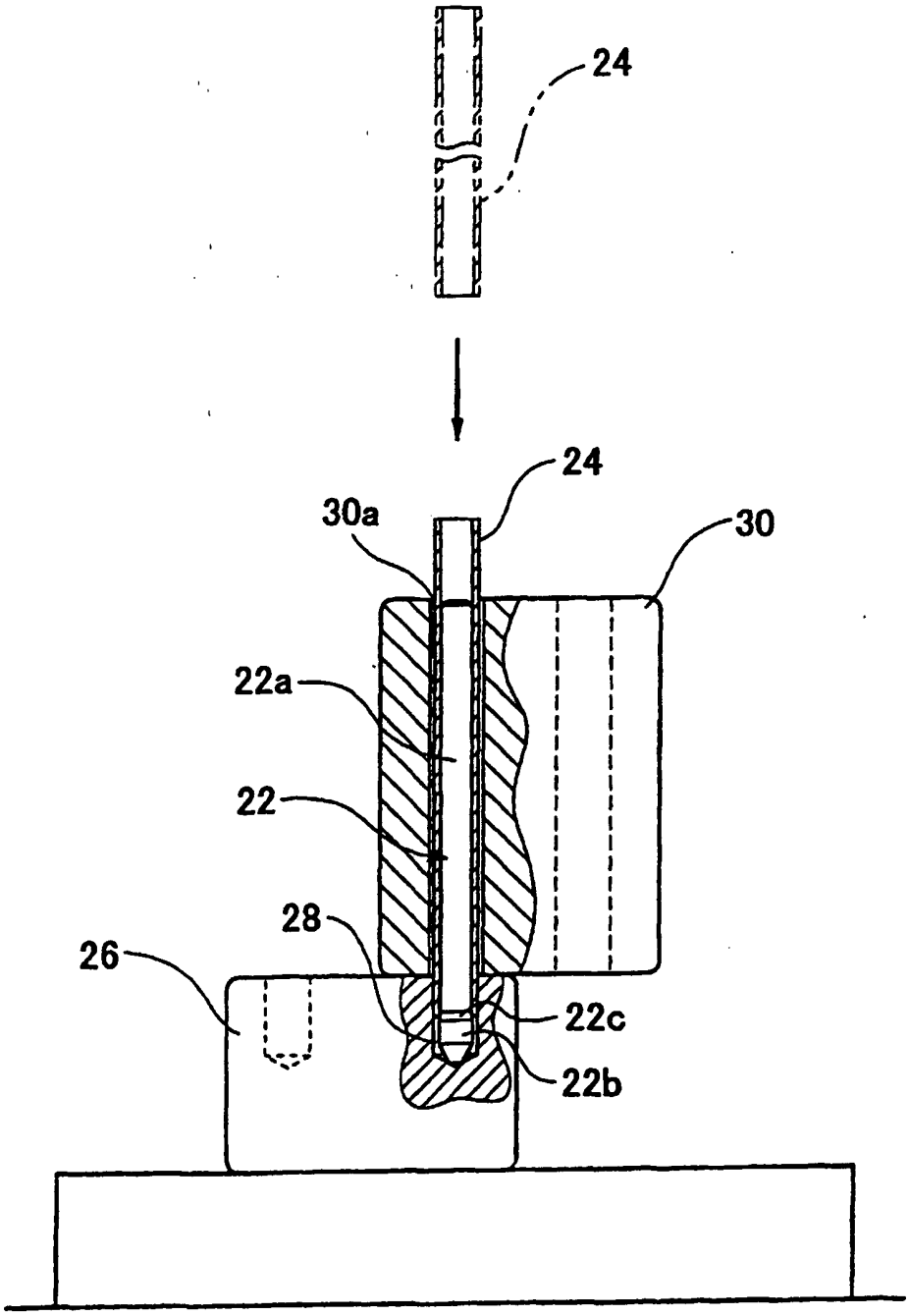

FIG. 8

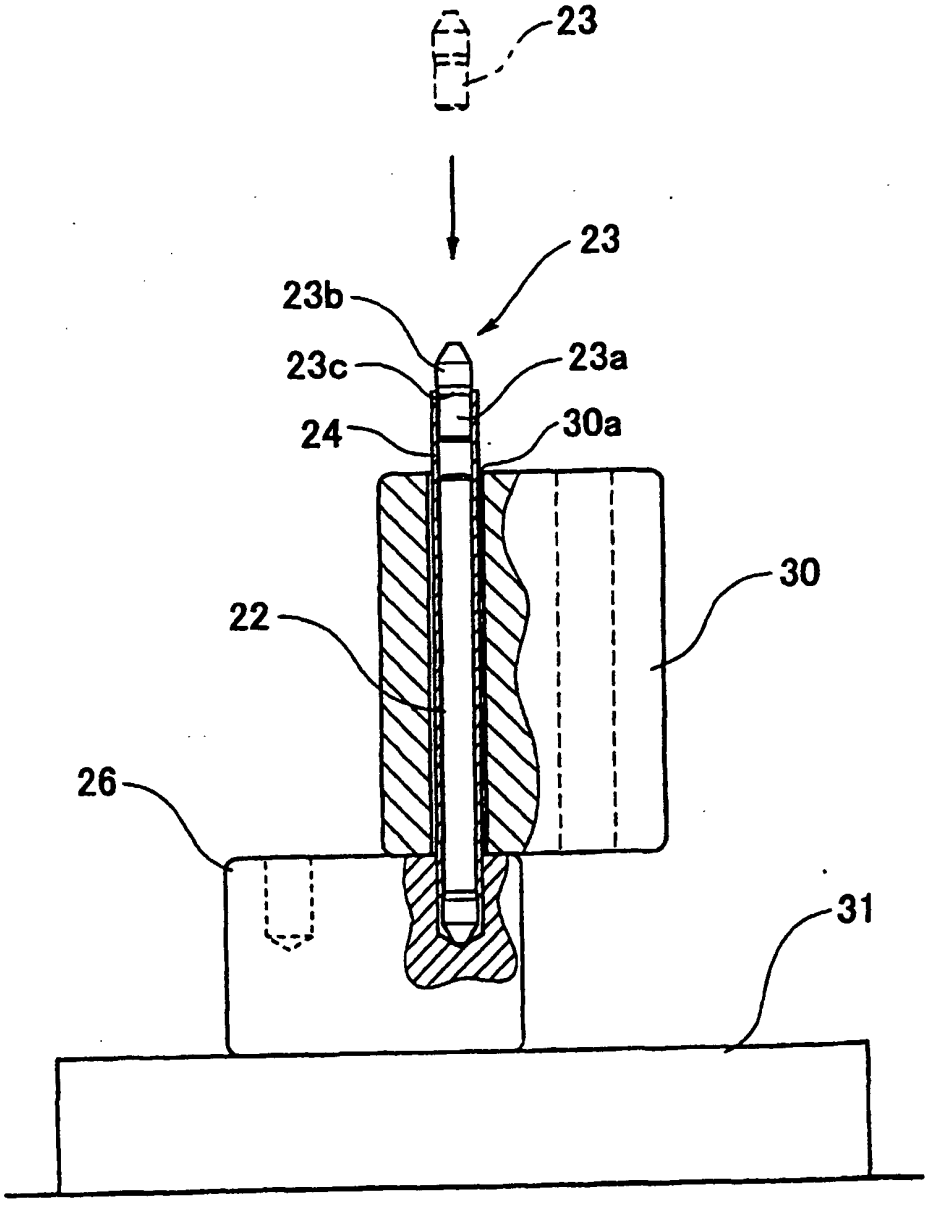

FIG. 9

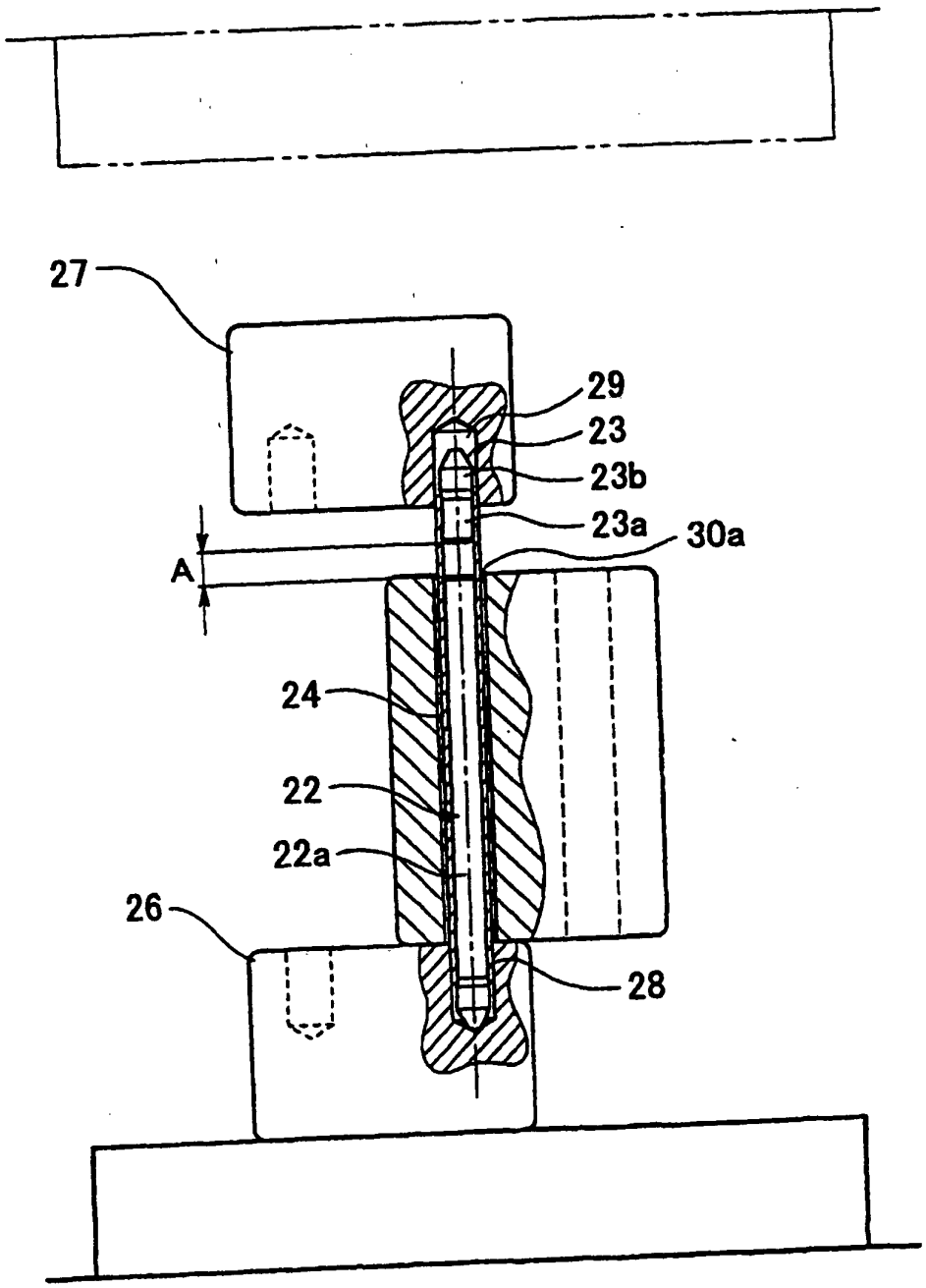

FIG. 10

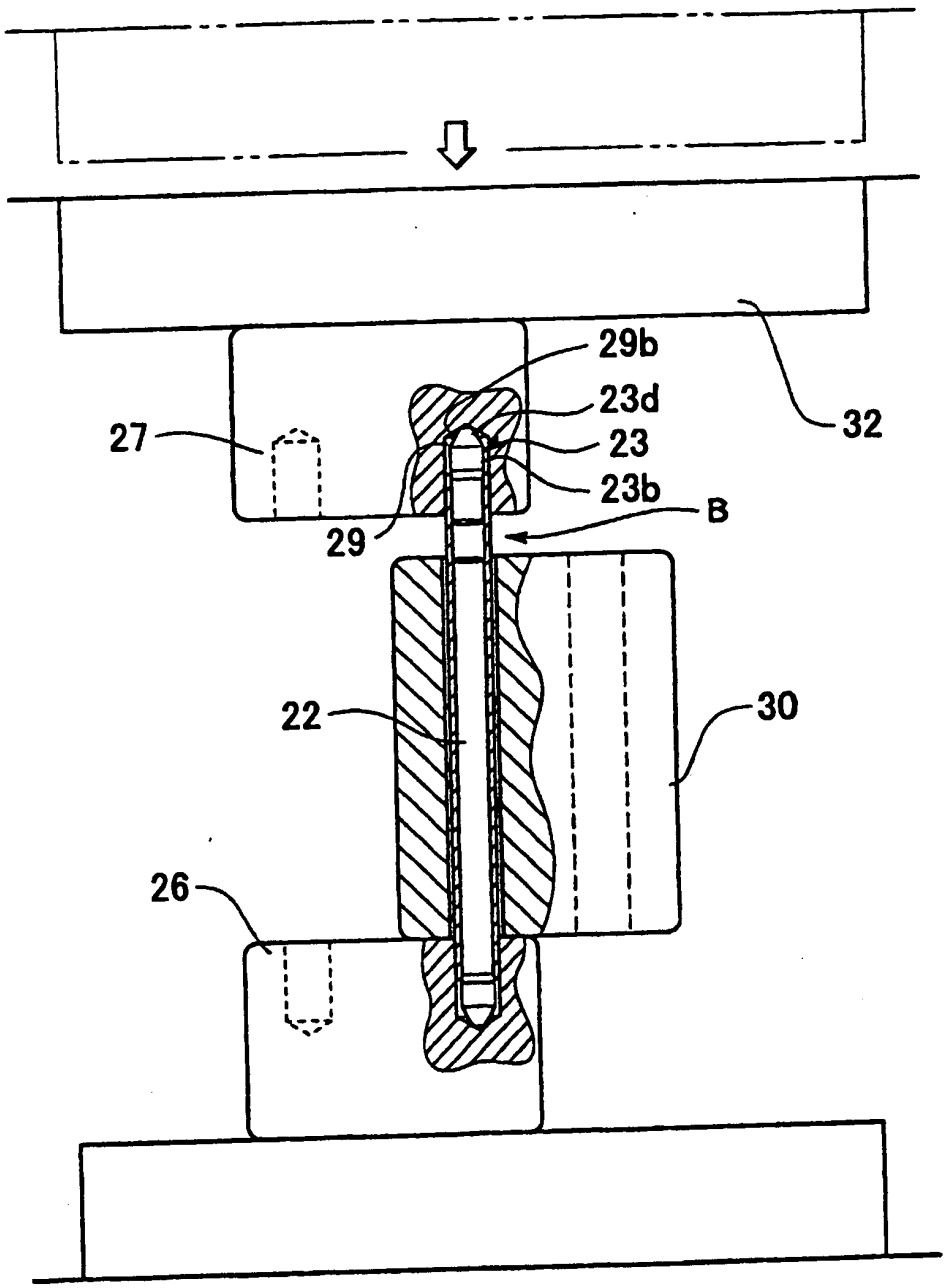

FIG. 11

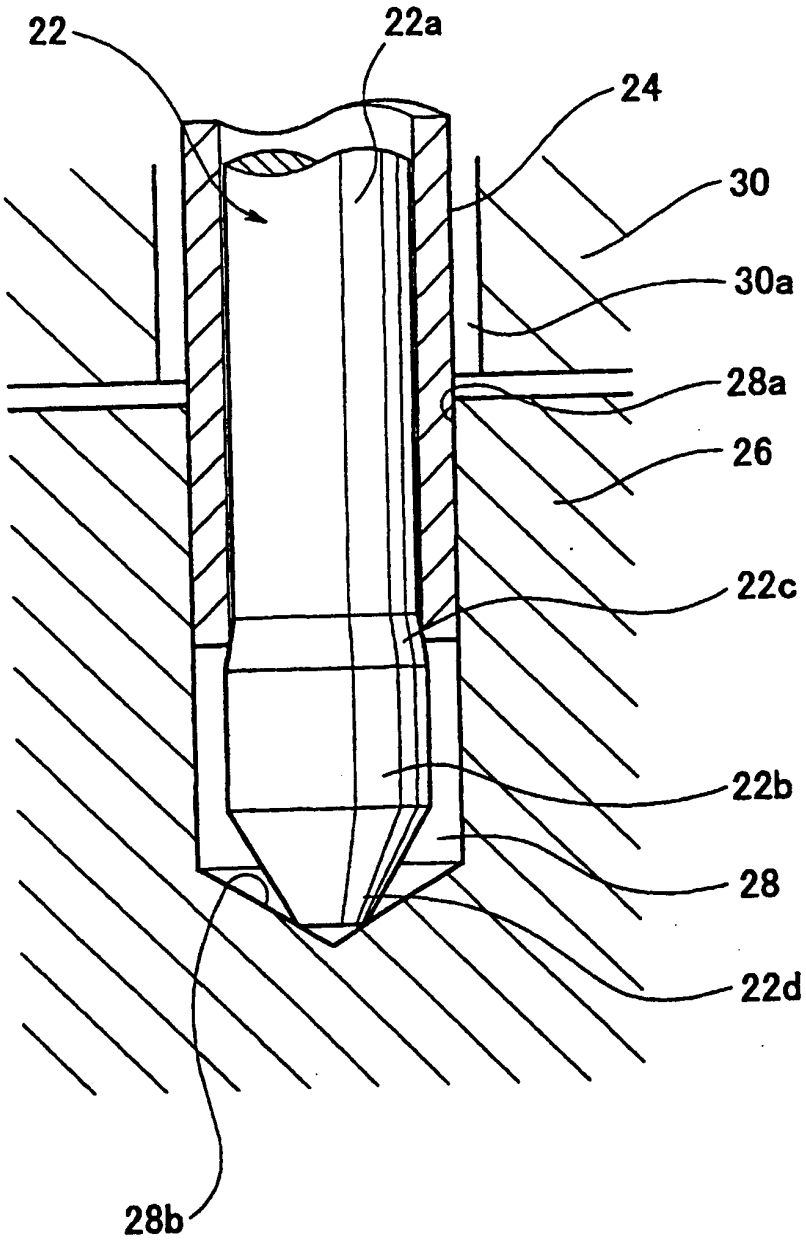

FIG. 12

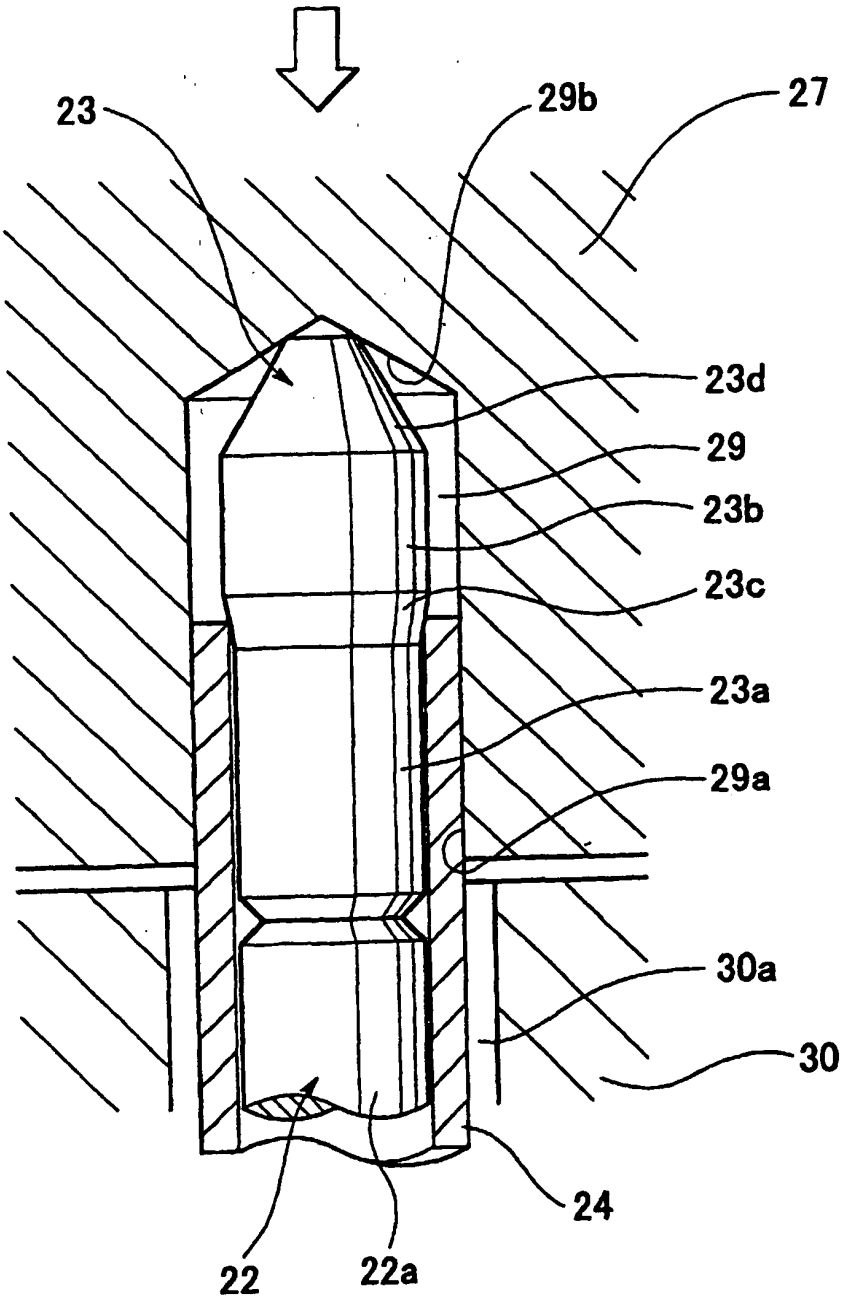

FIG. 13

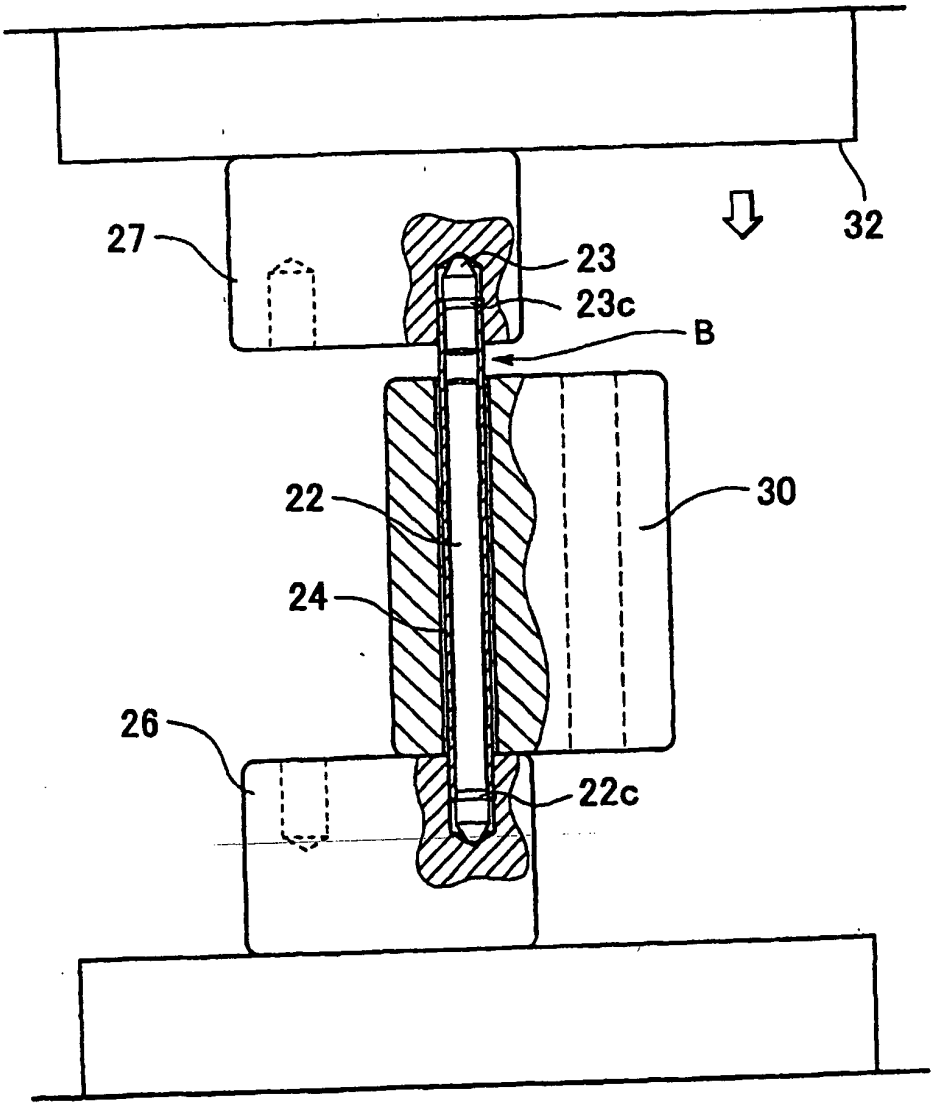

FIG. 14

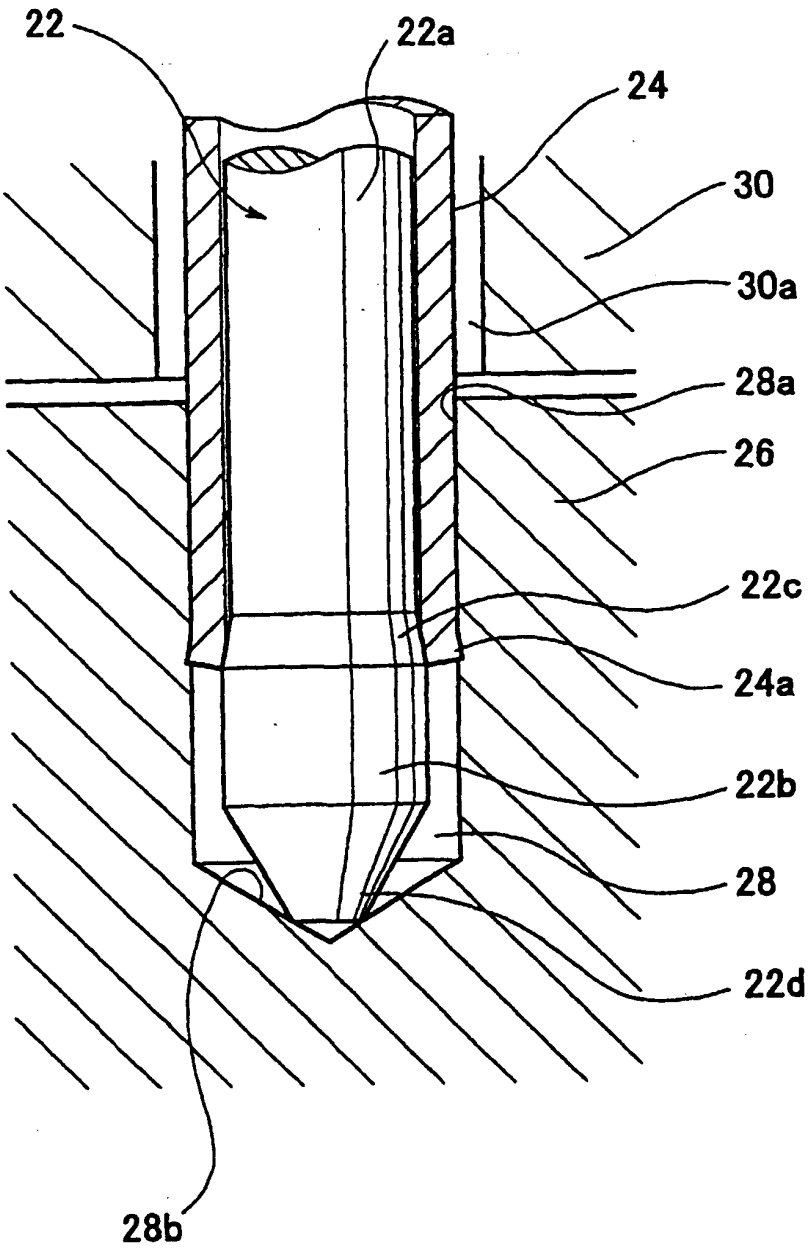

FIG. 15

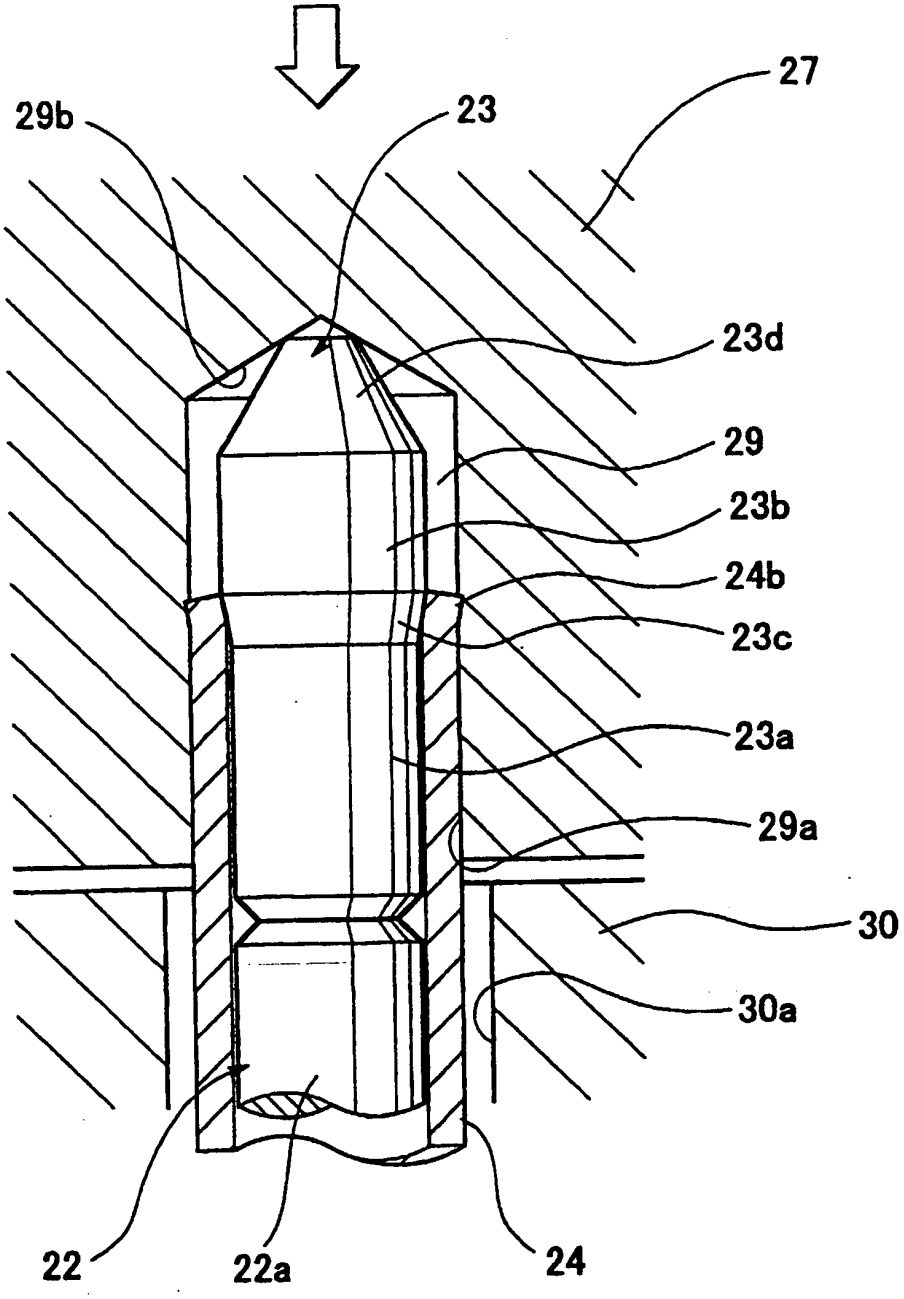

FIG. 16

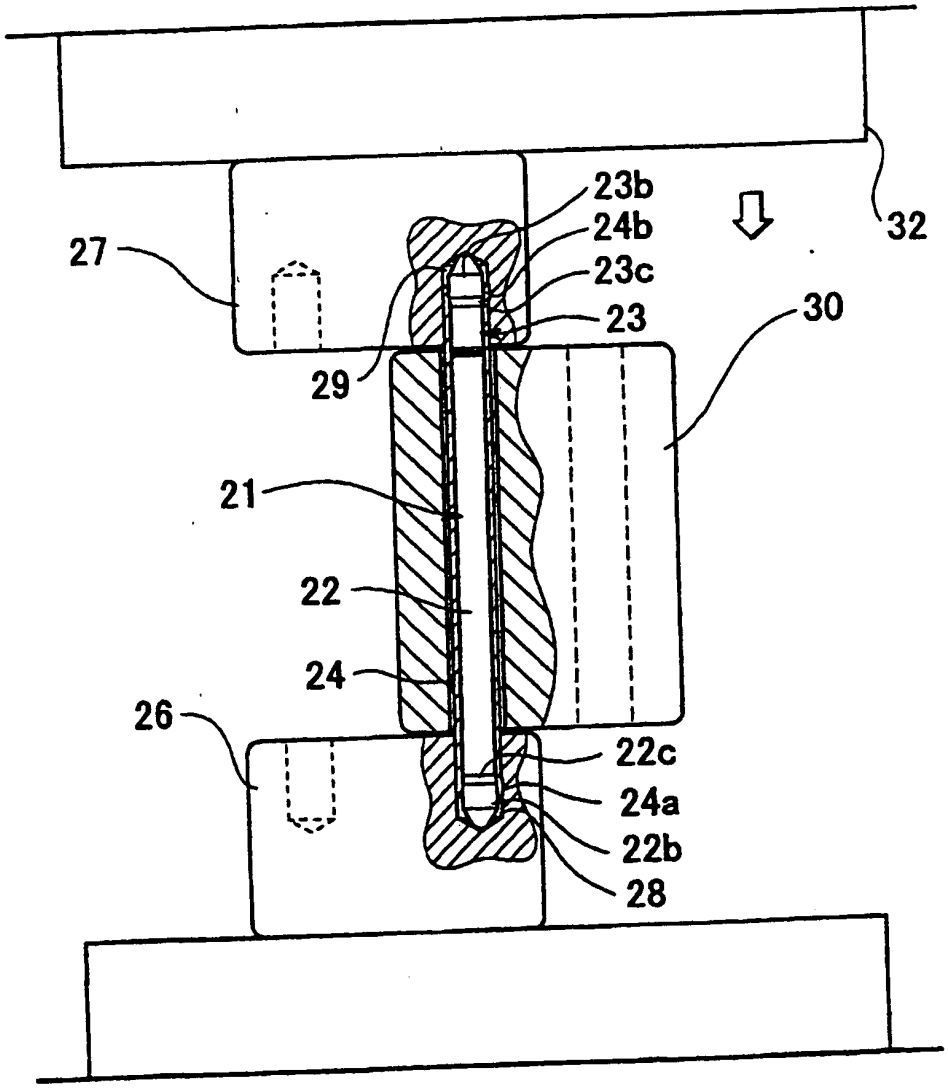

FIG. 17

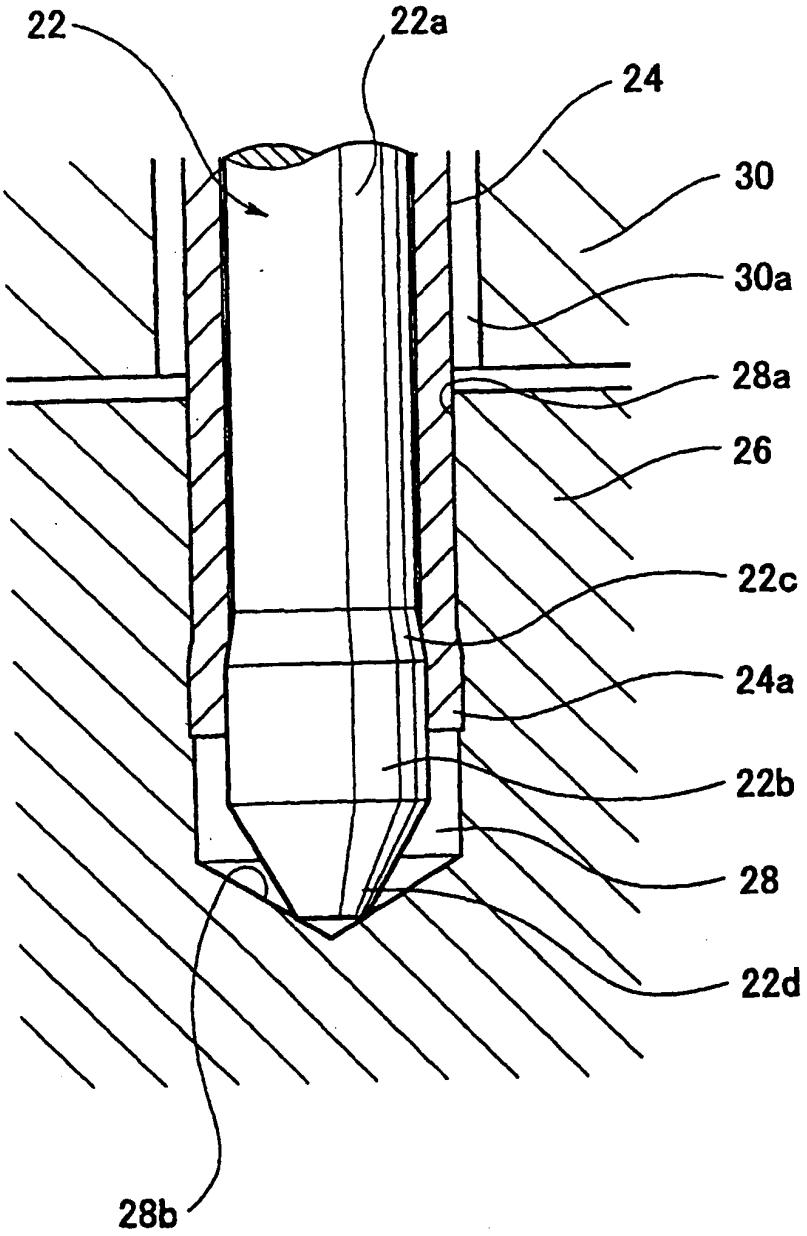

FIG. 18

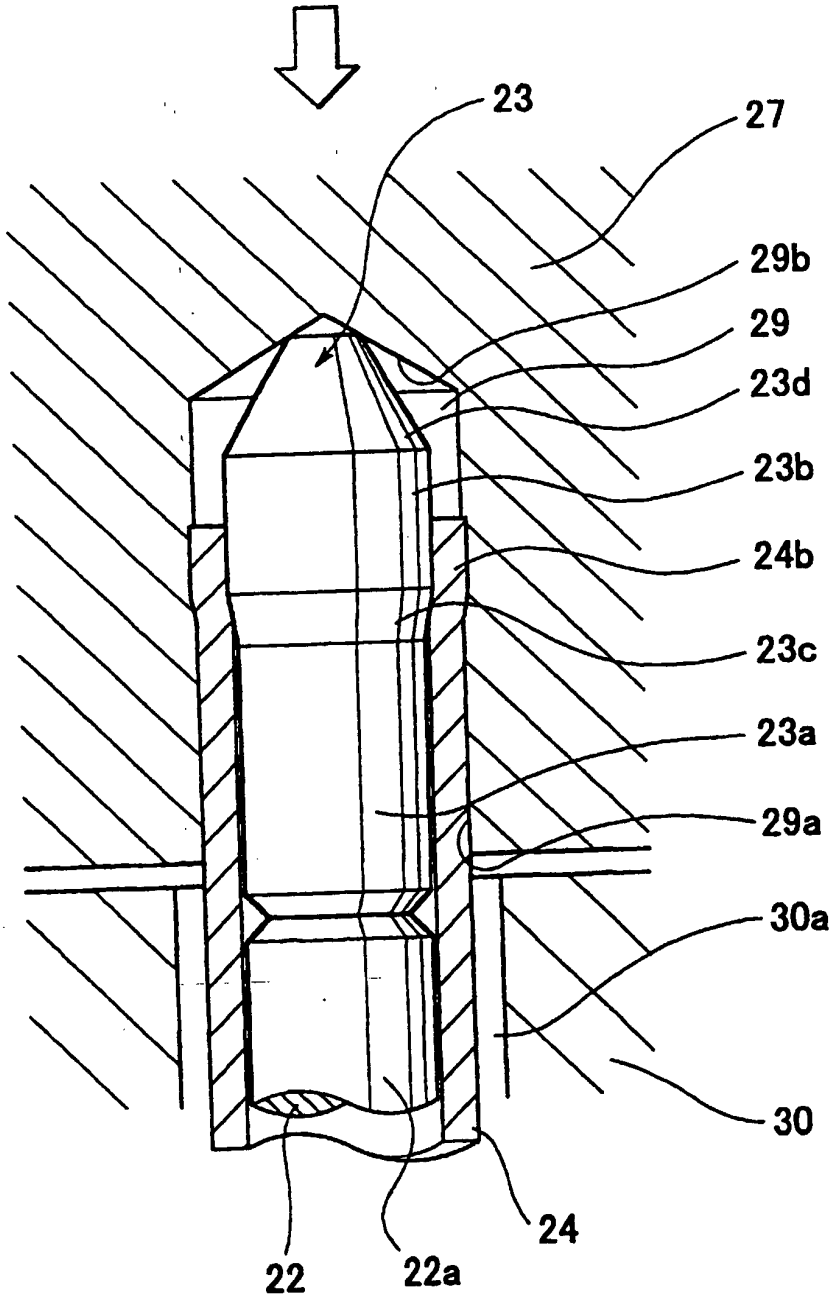

FIG. 19

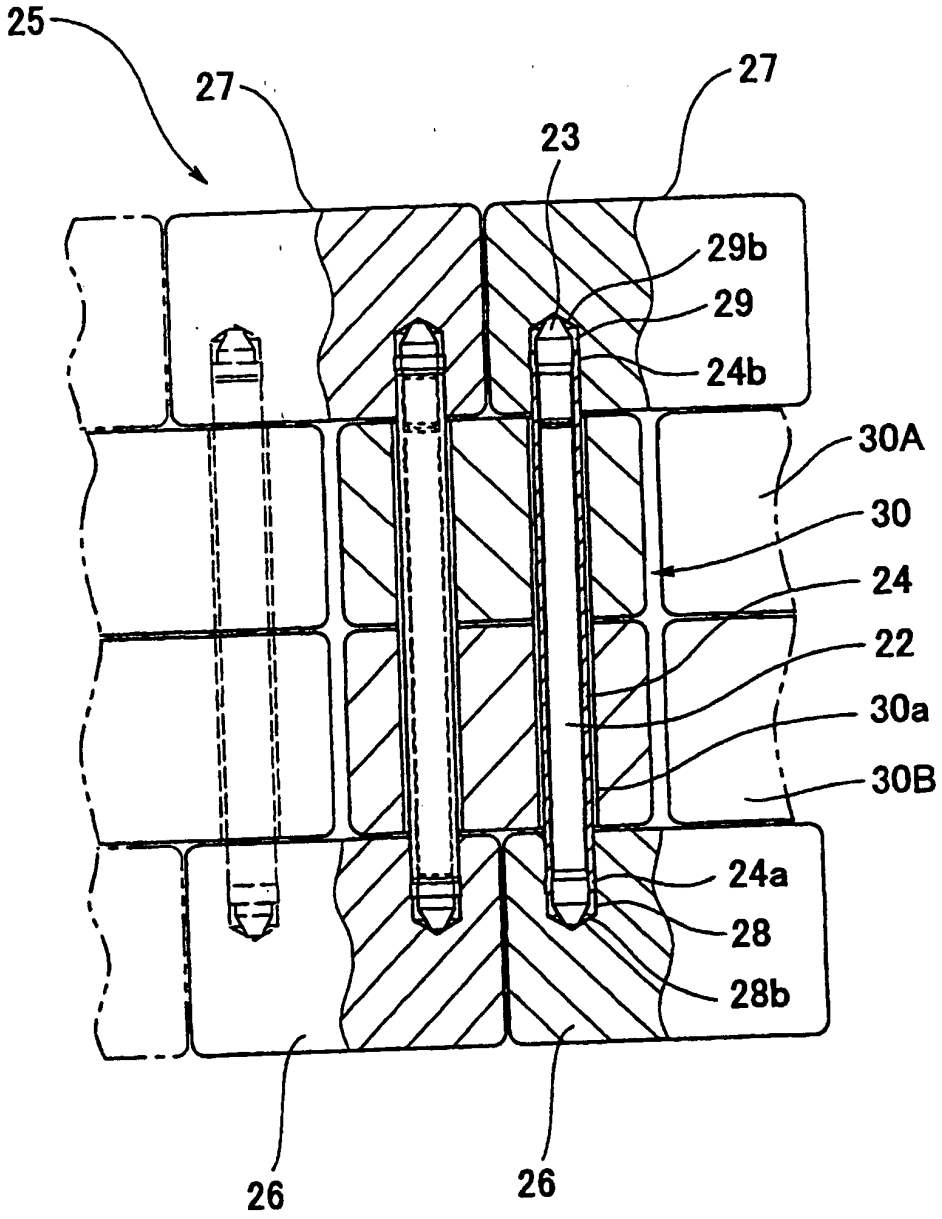

FIG. 20

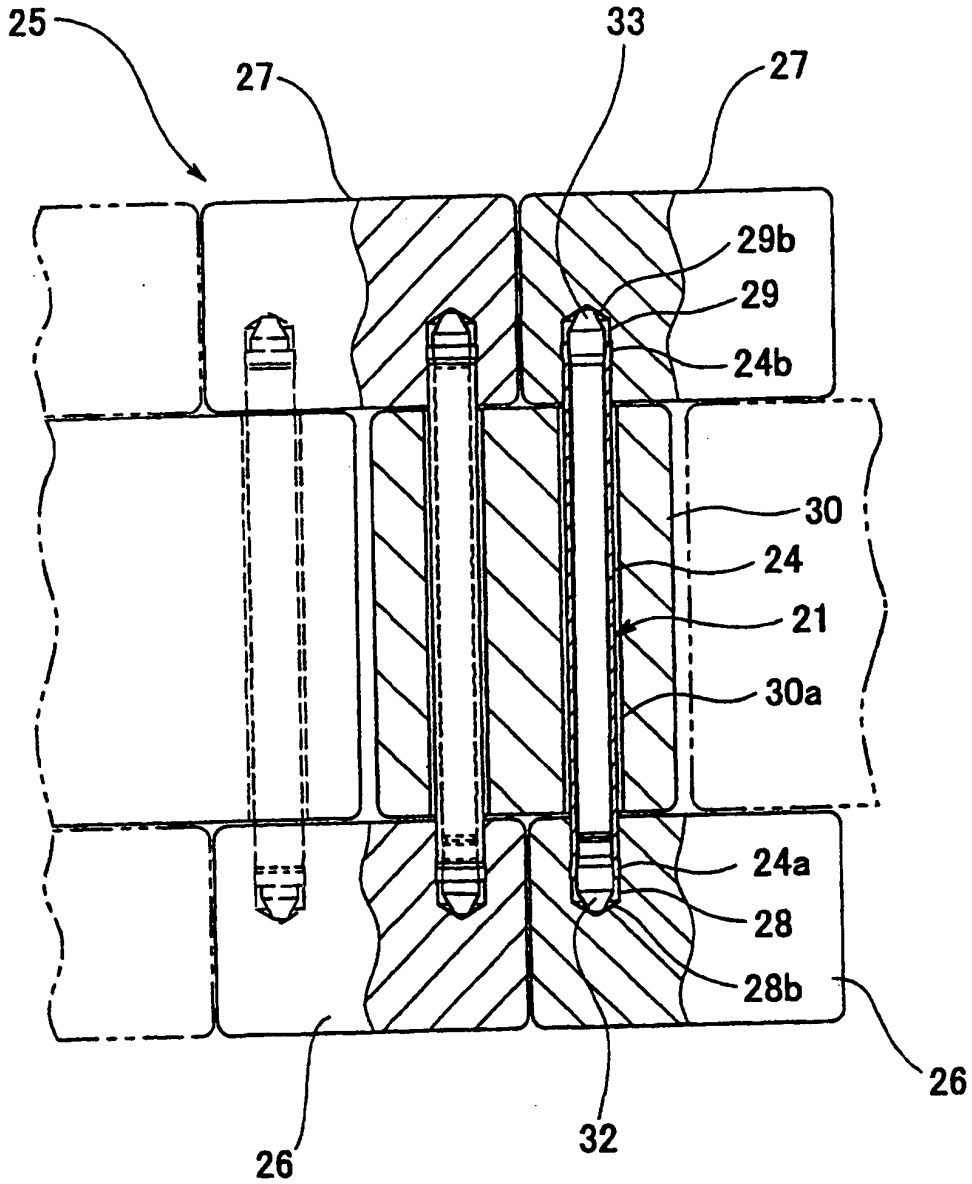

FIG. 21

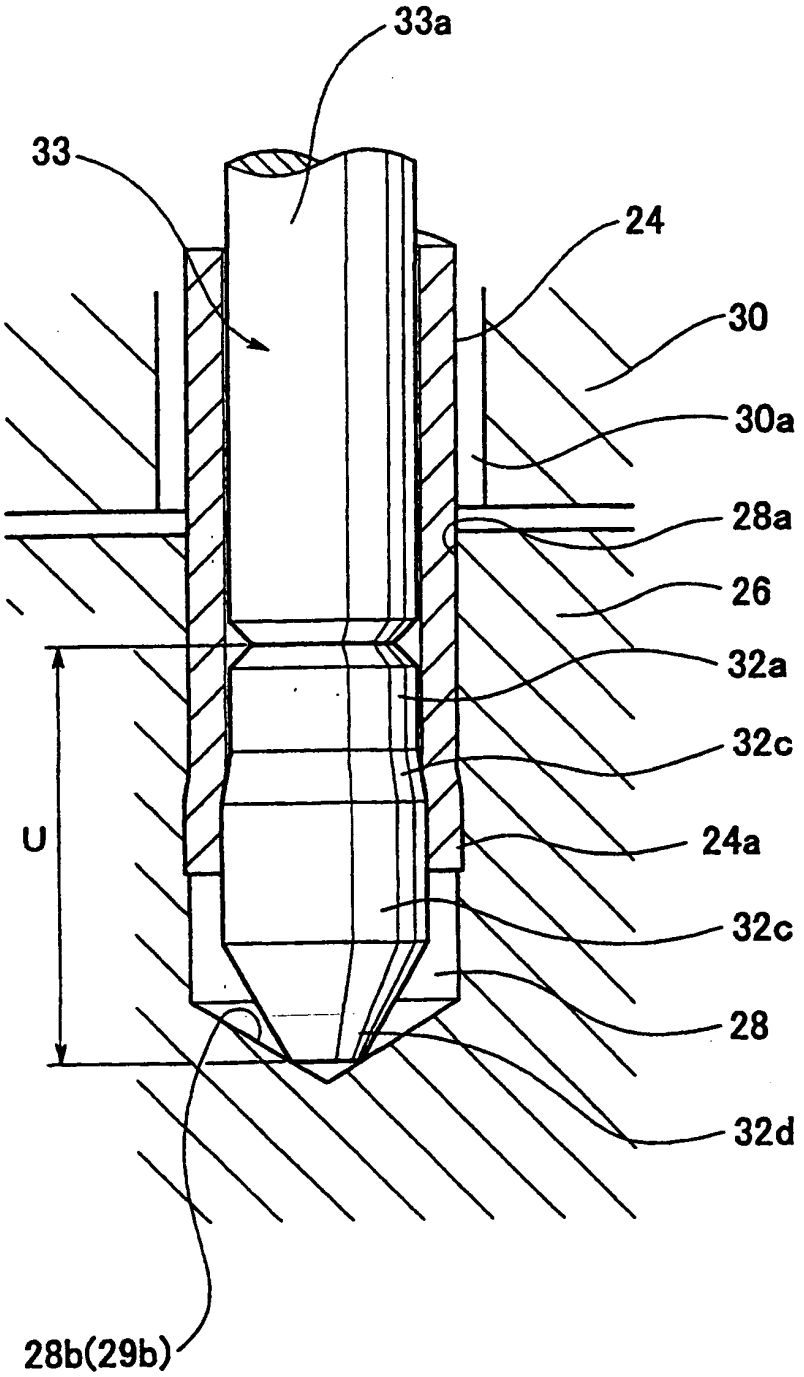

FIG. 22

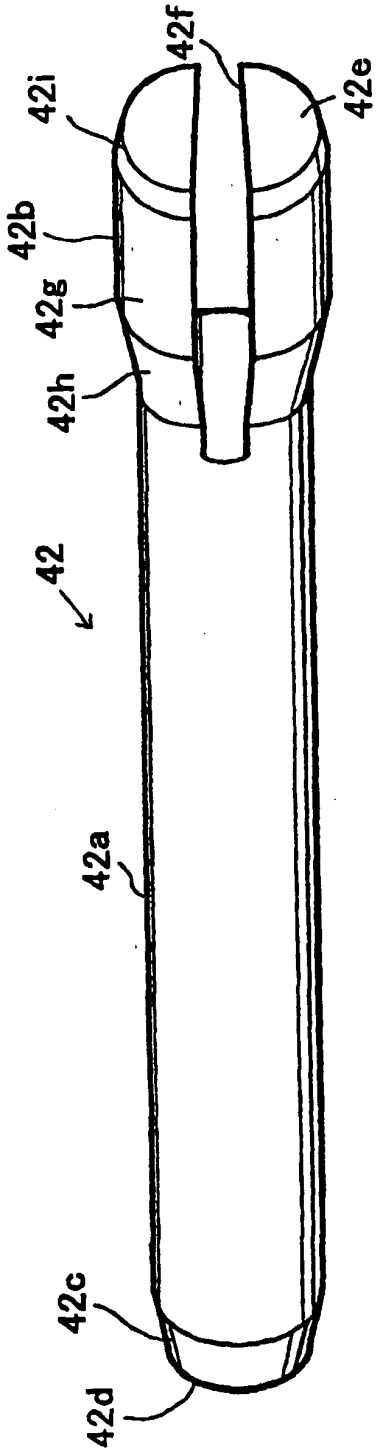

FIG. 23

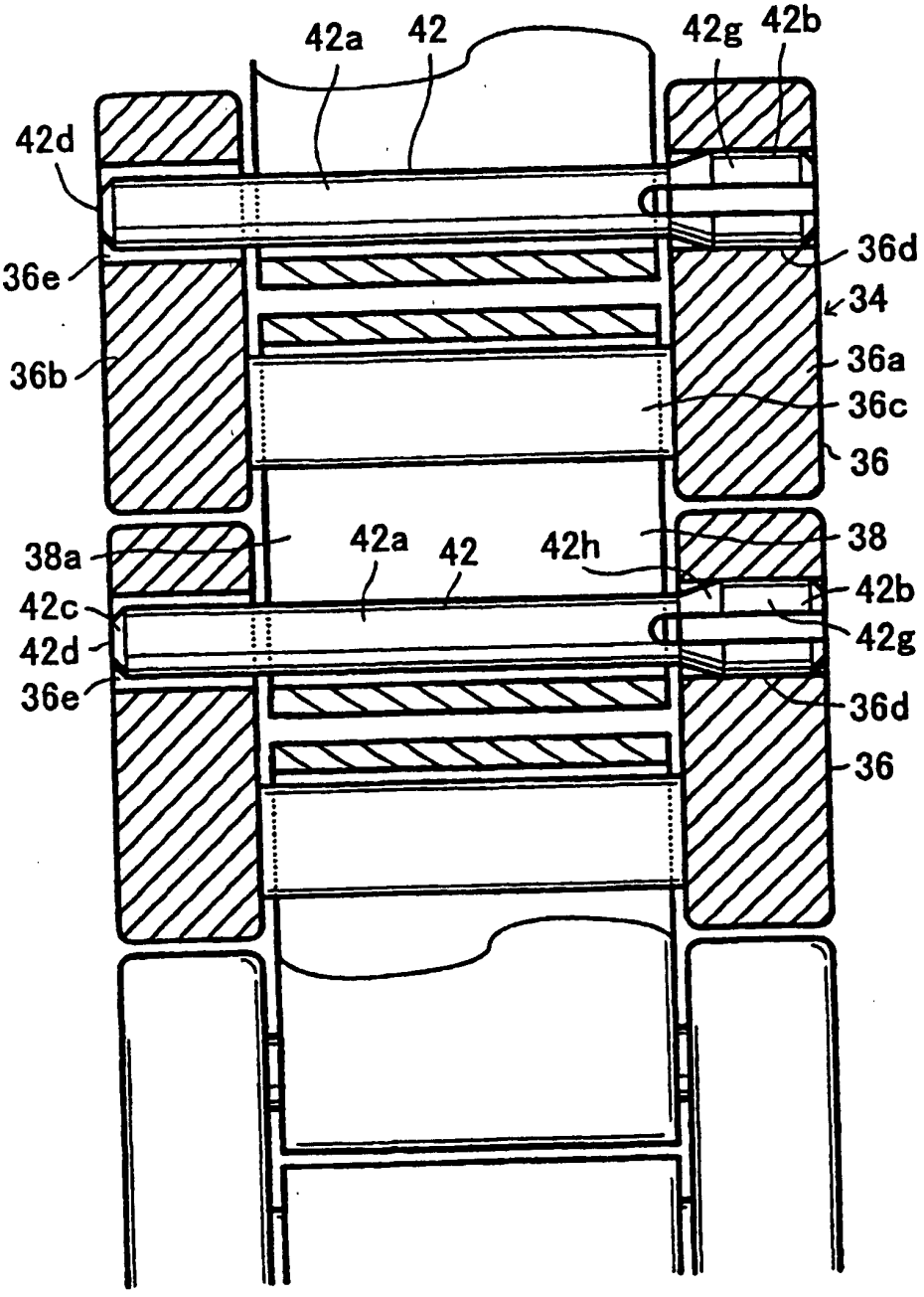
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FIG. 24

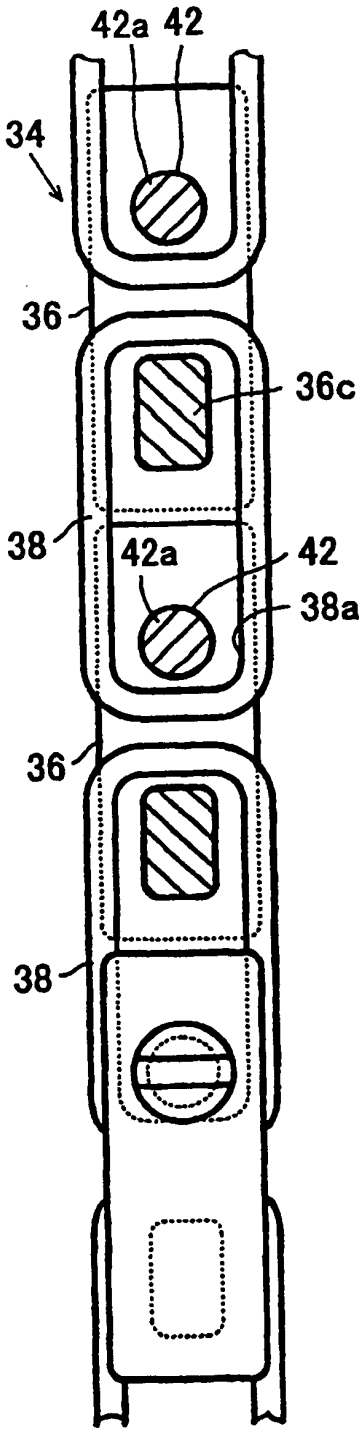

FIG. 25

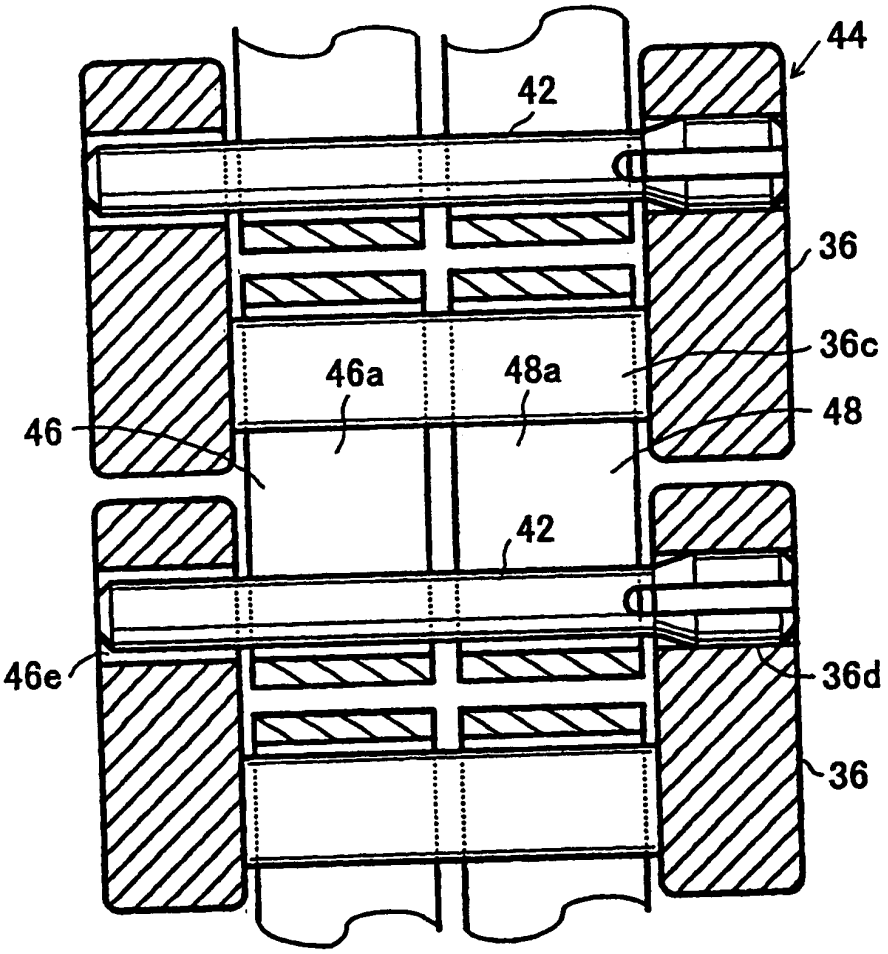

FIG. 26

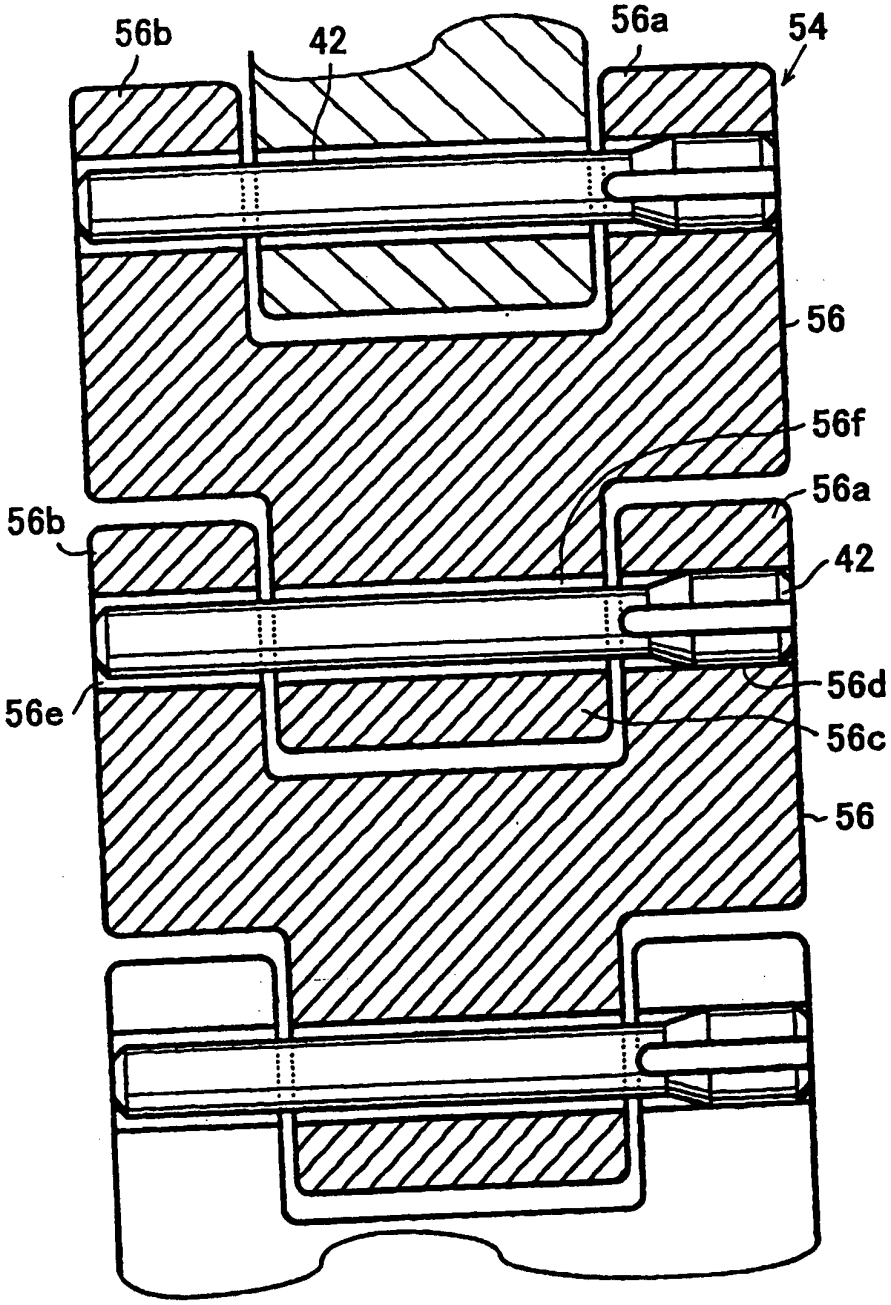

FIG. 27

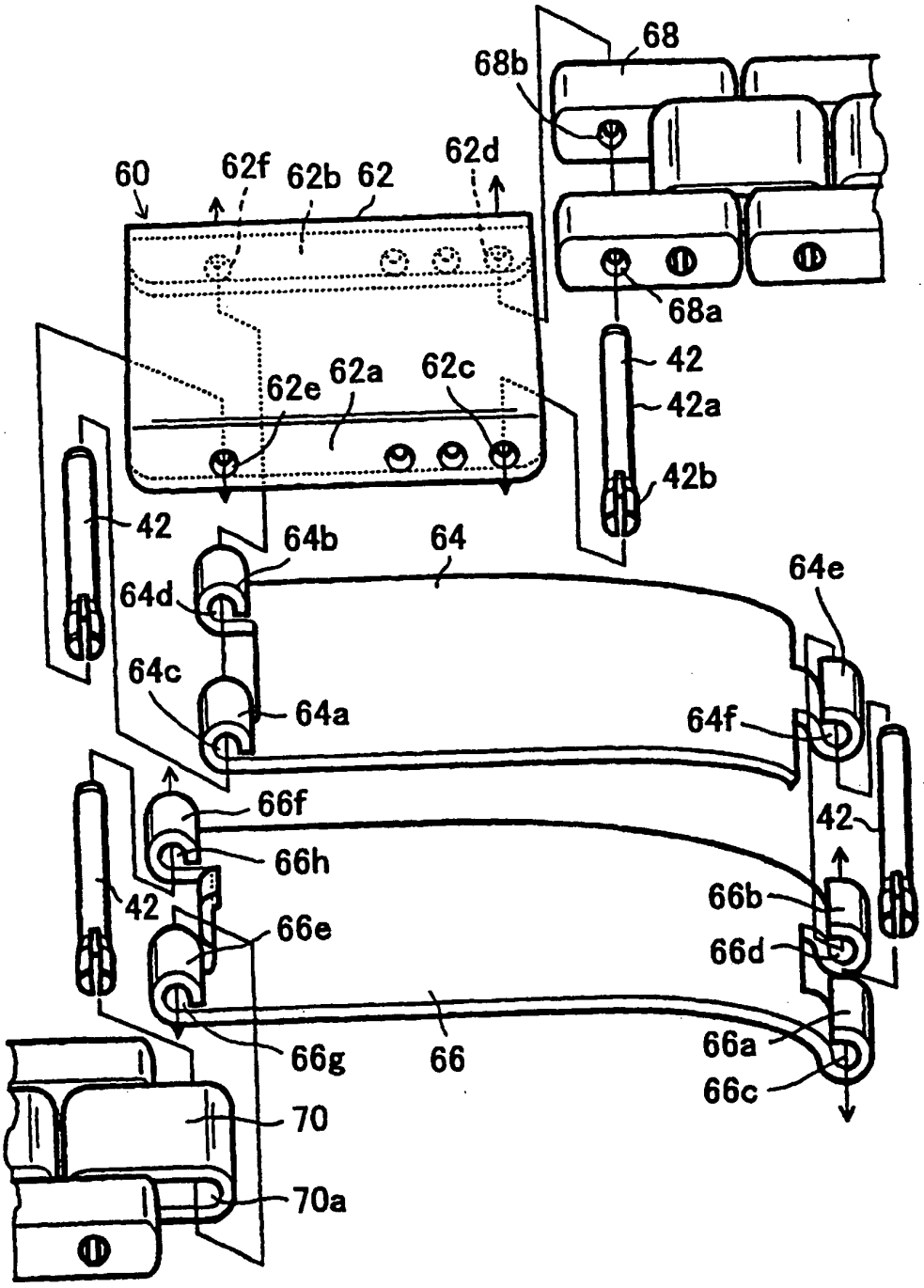
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FIG. 28

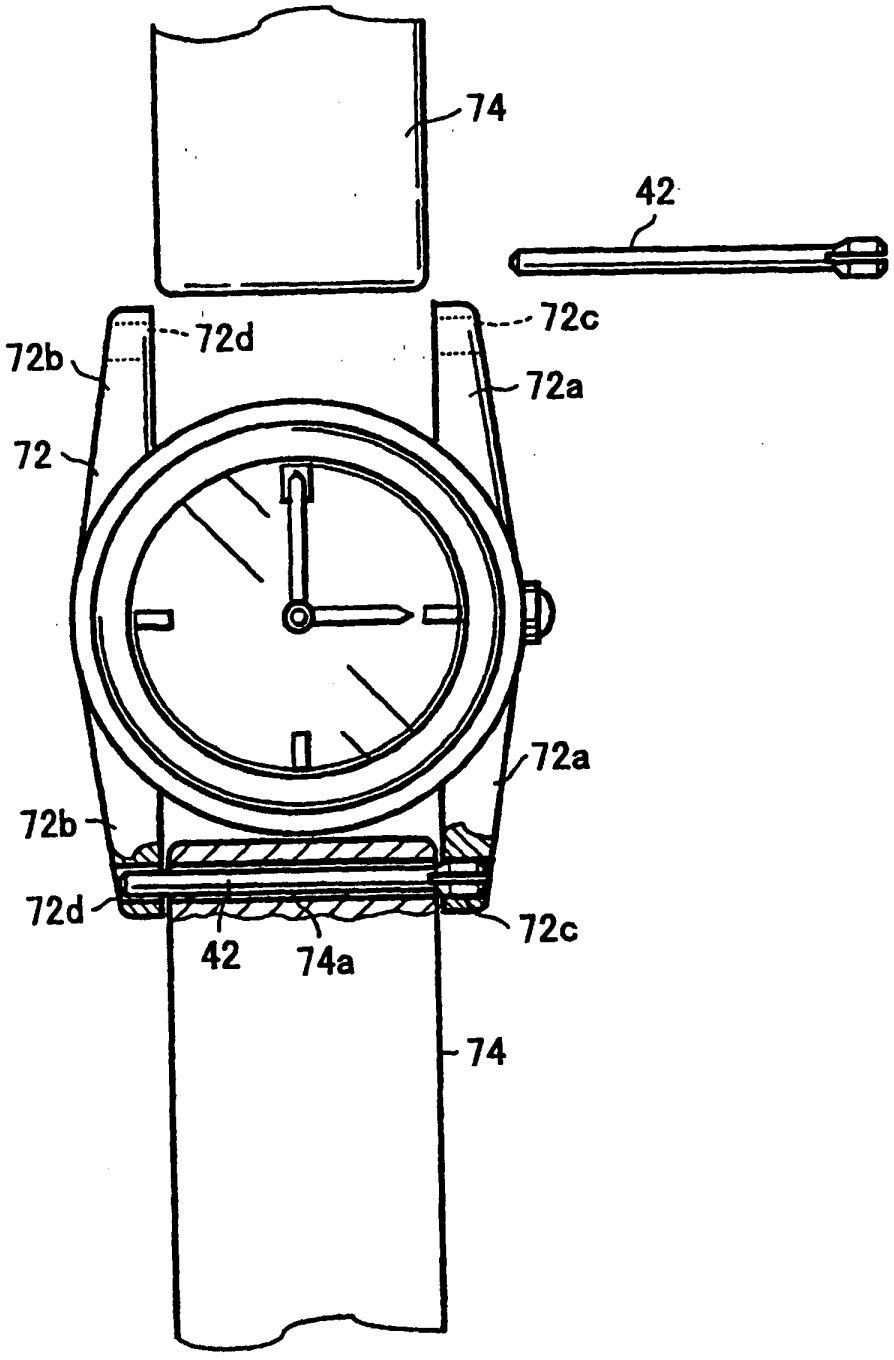

FIG. 29

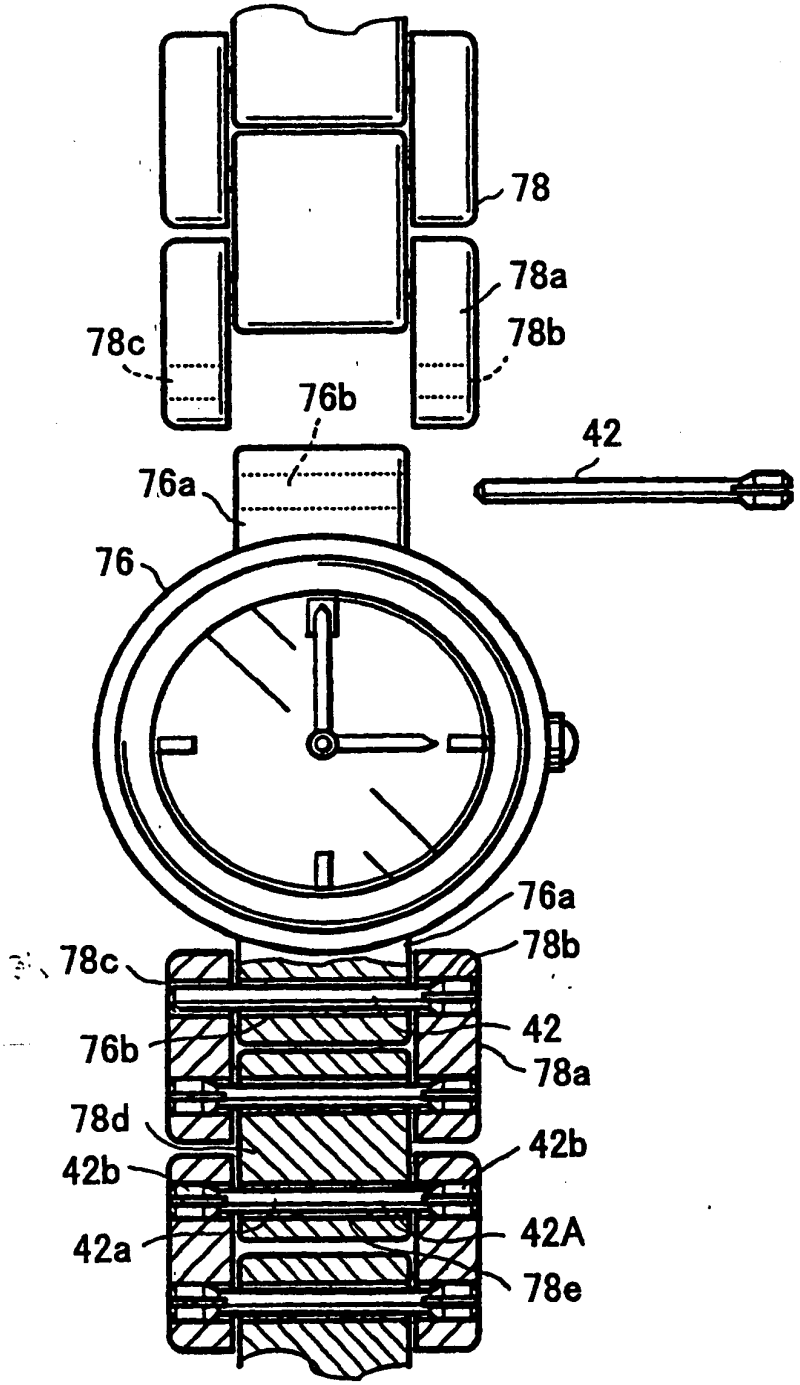
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FIG. 30

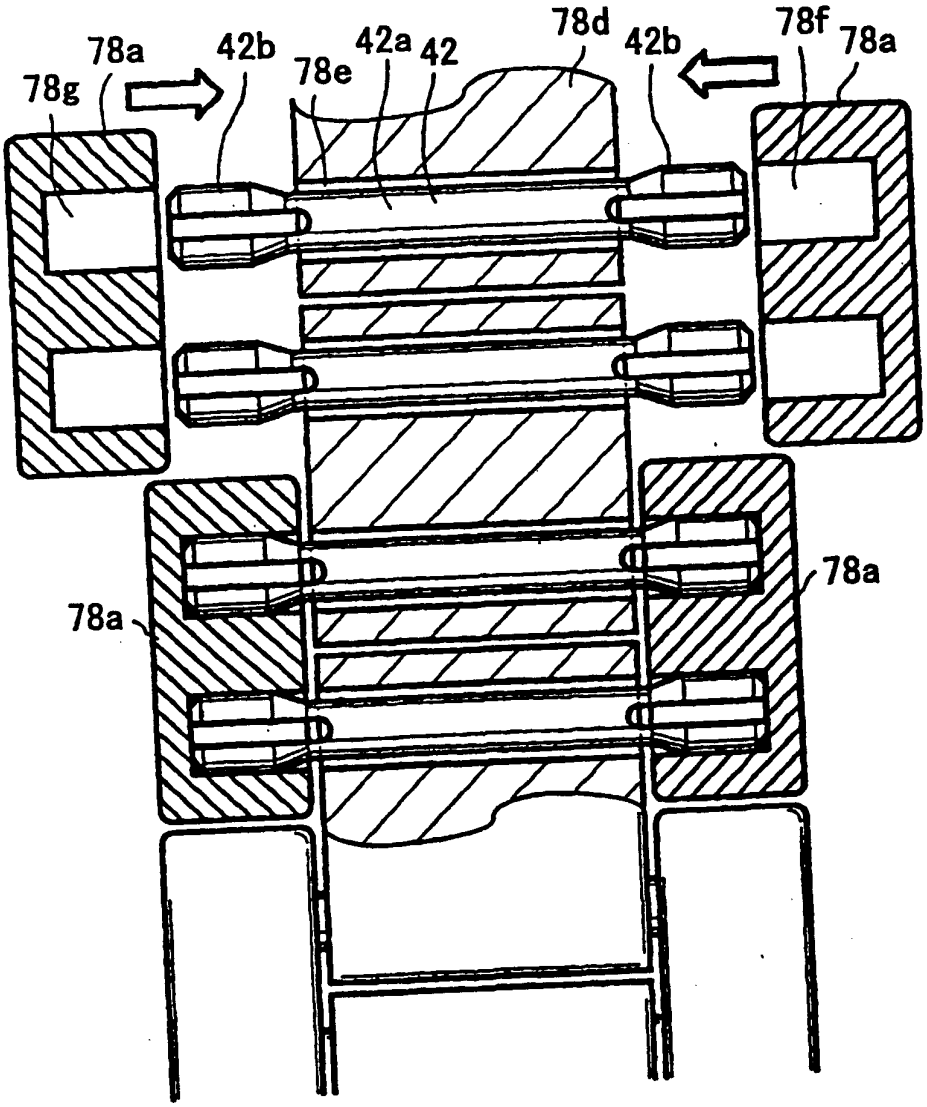

FIG. 31

FIG. 32

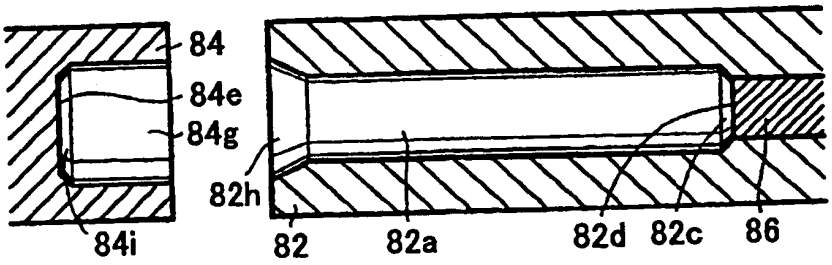

FIG. 33

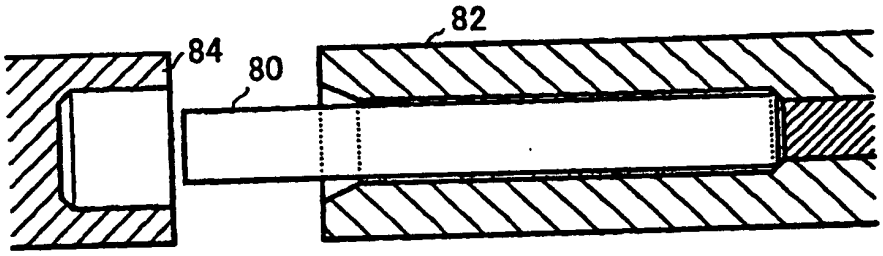

FIG. 34

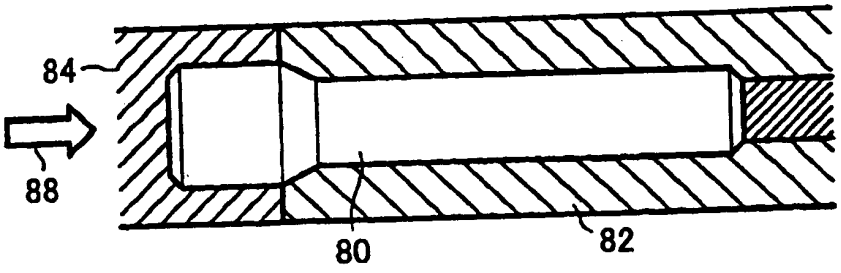

FIG. 35

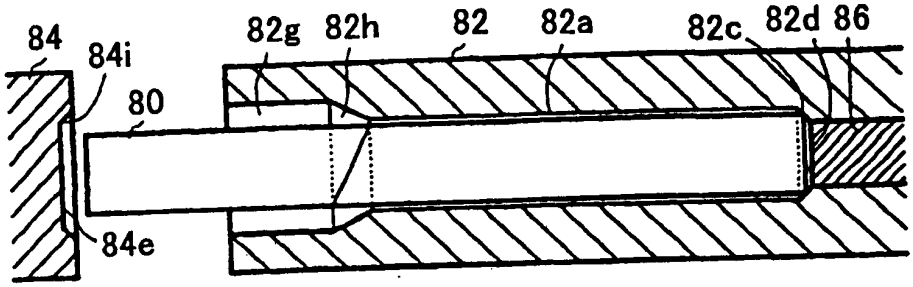

FIG. 36

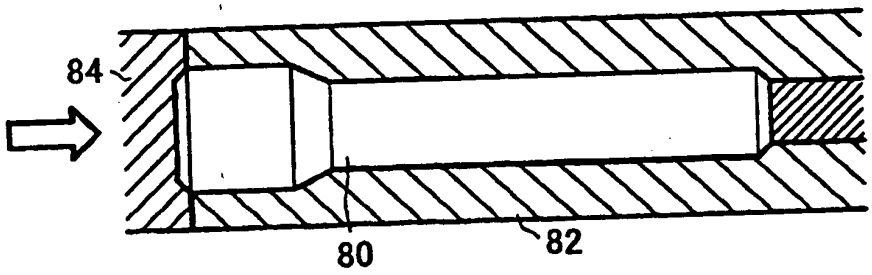

FIG. 37

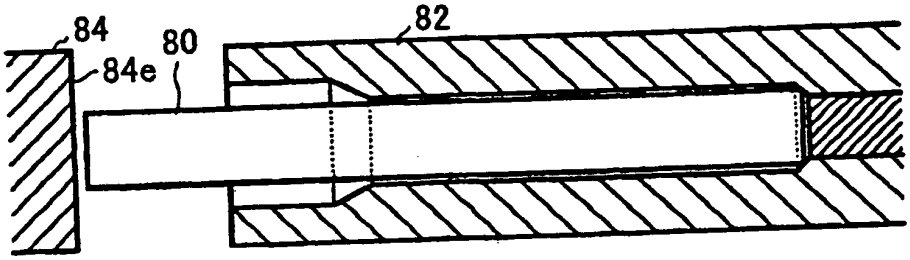

FIG. 38

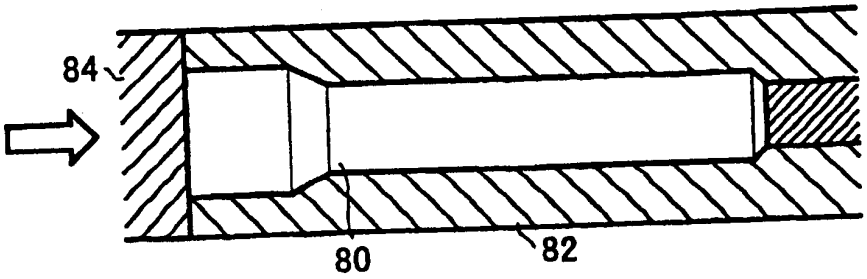

FIG. 39

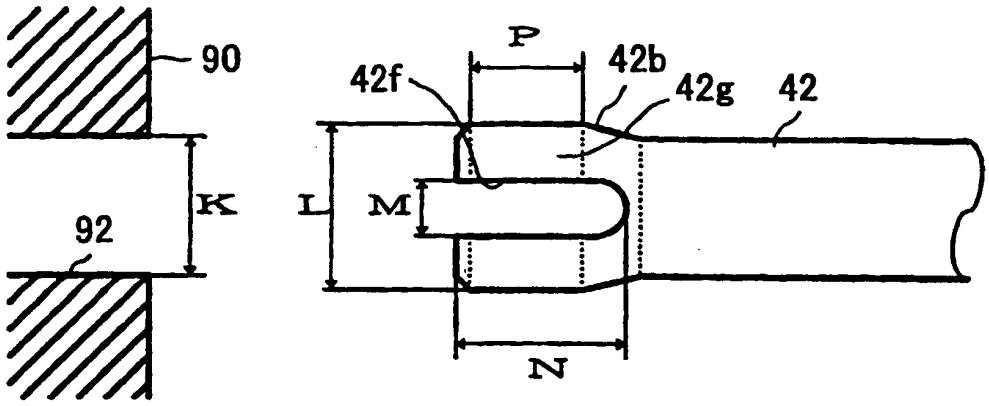

FIG. 40

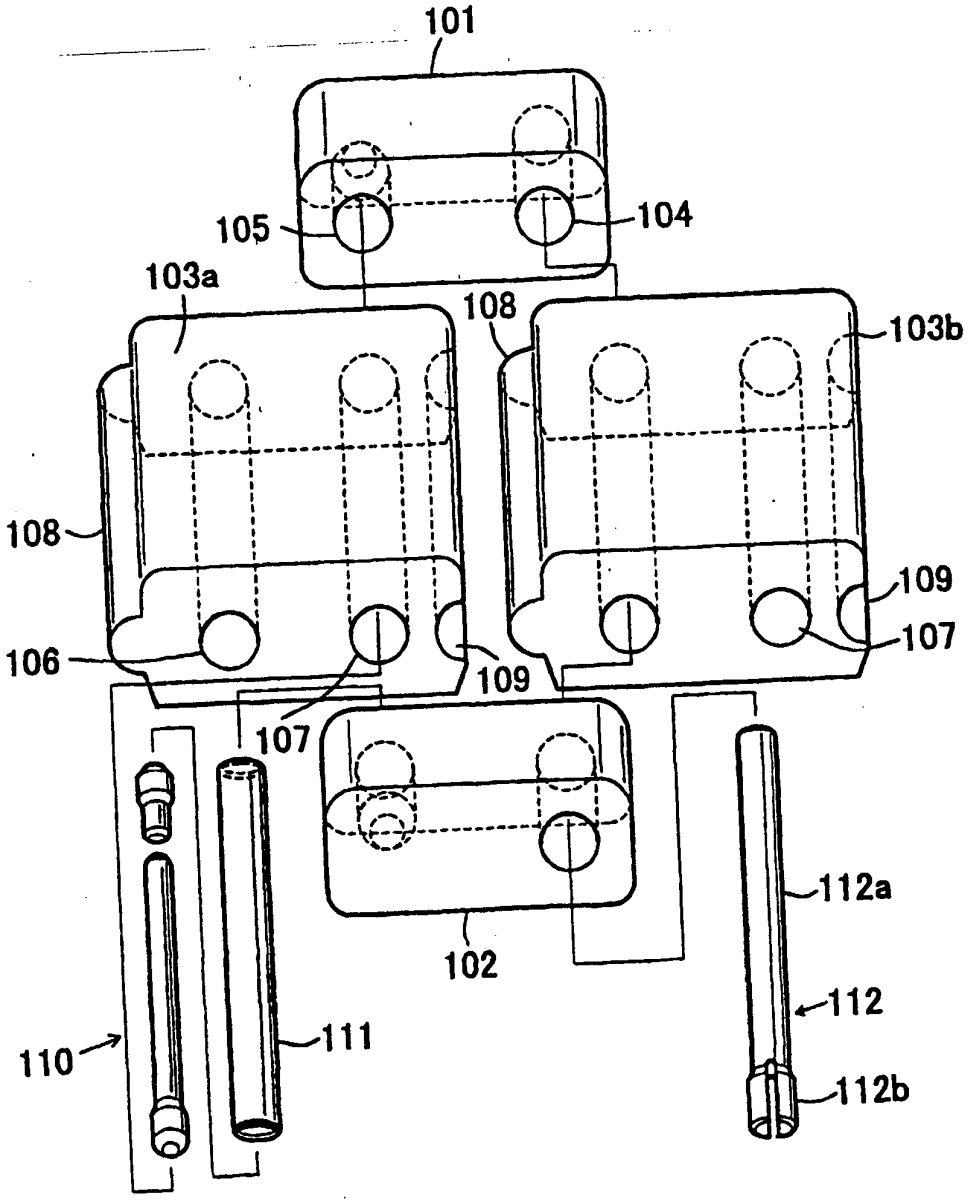
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FIG. 41

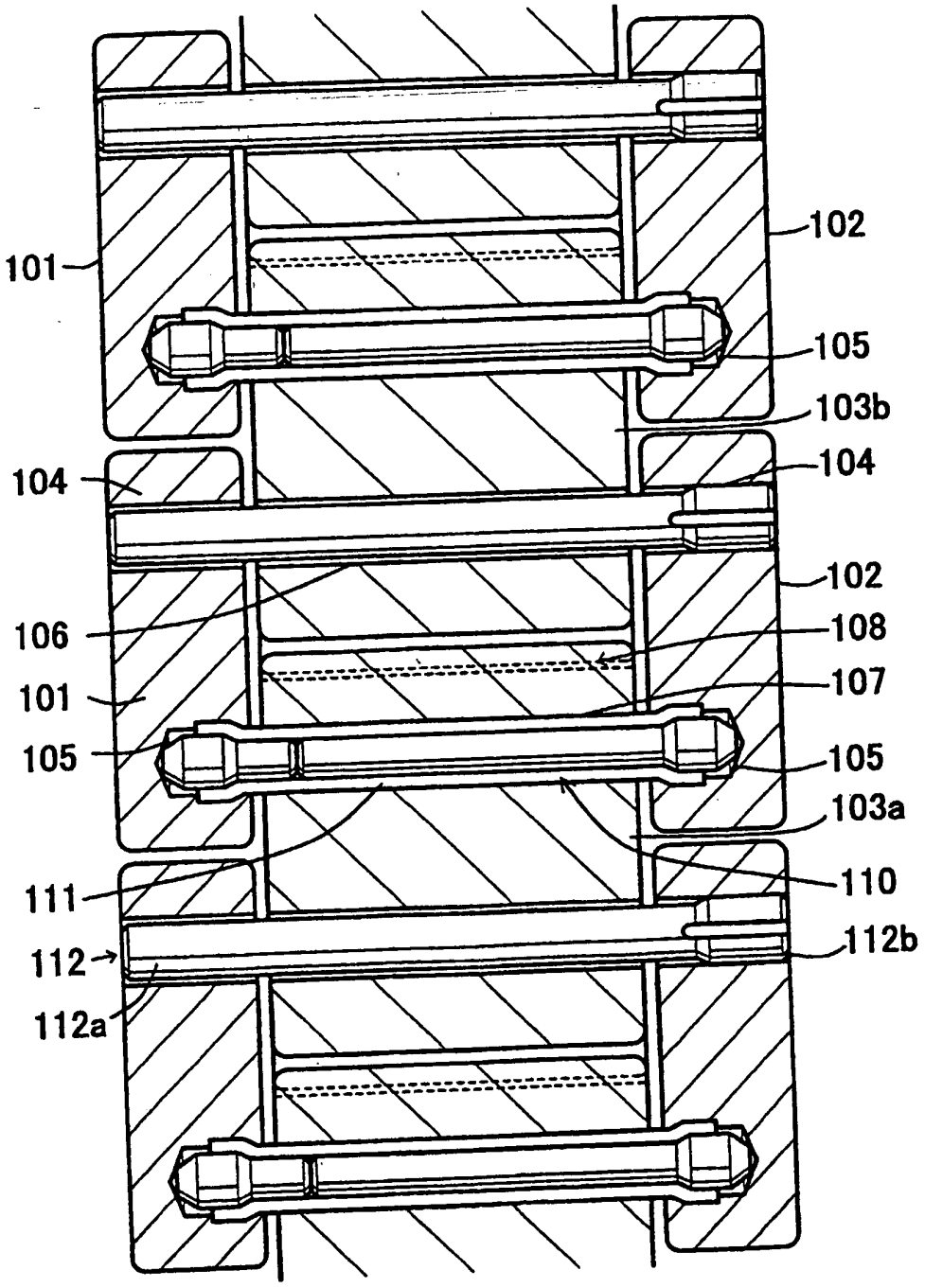
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FIG. 42

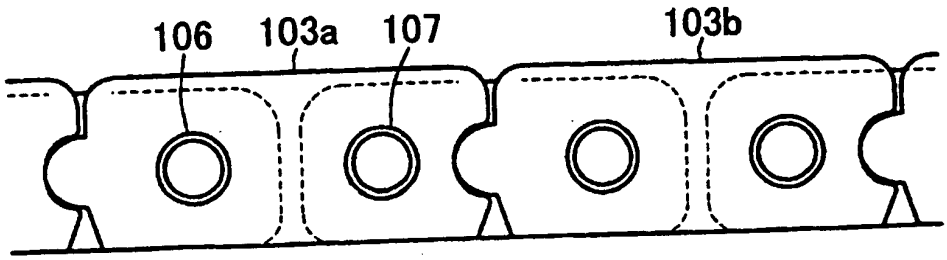


FIG. 43

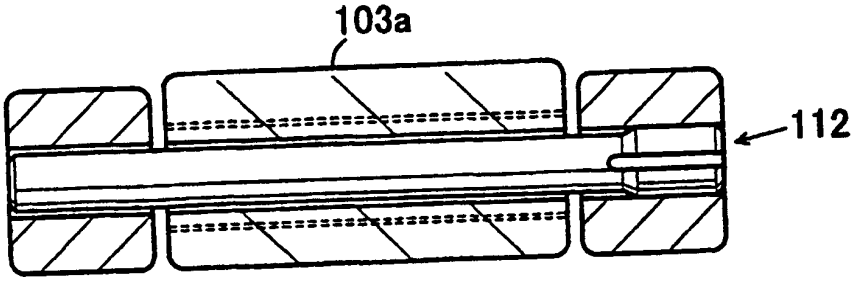


FIG. 44

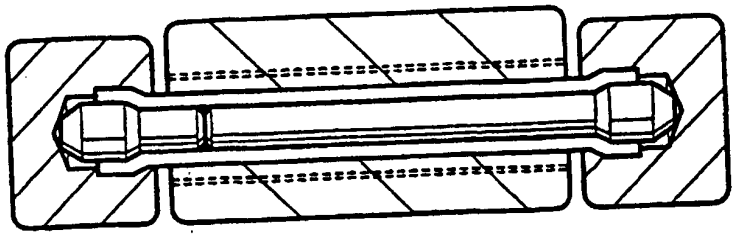


FIG. 45

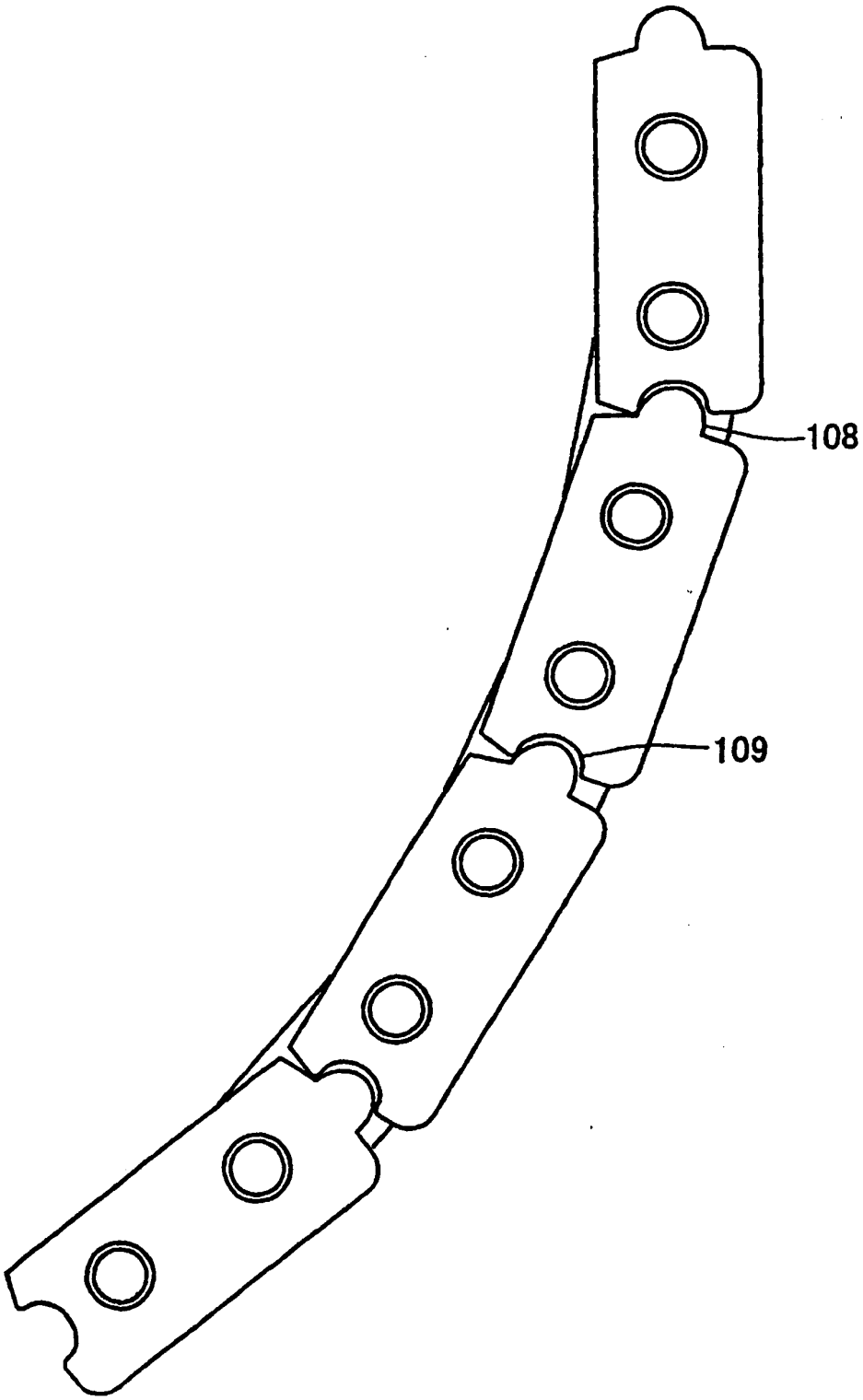


FIG. 46

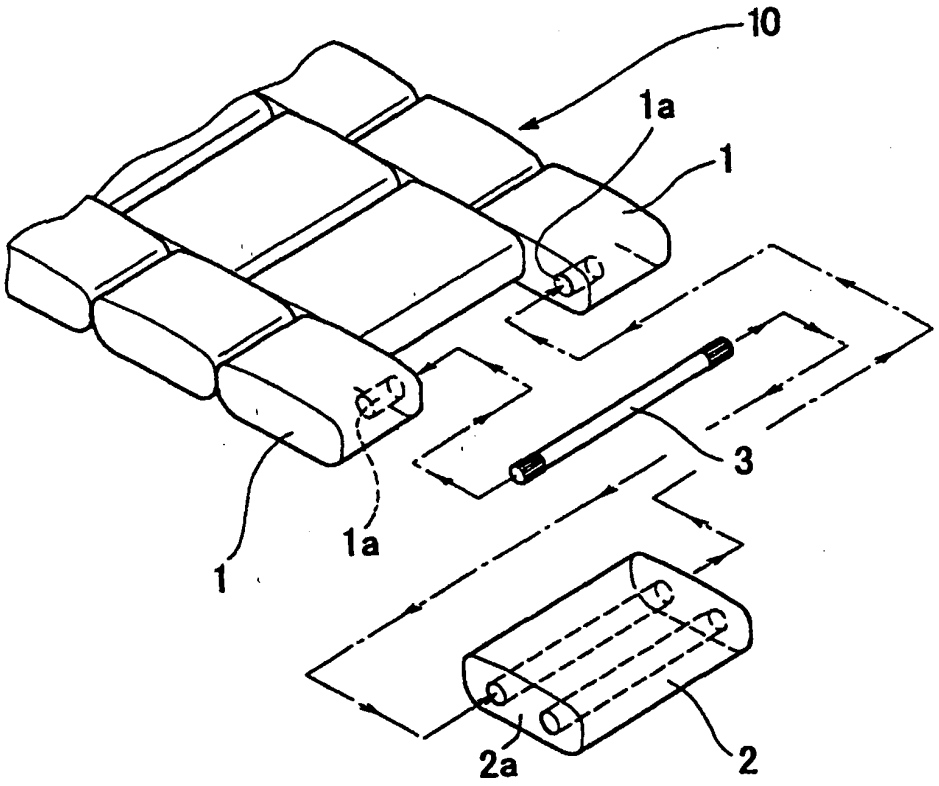


FIG. 47

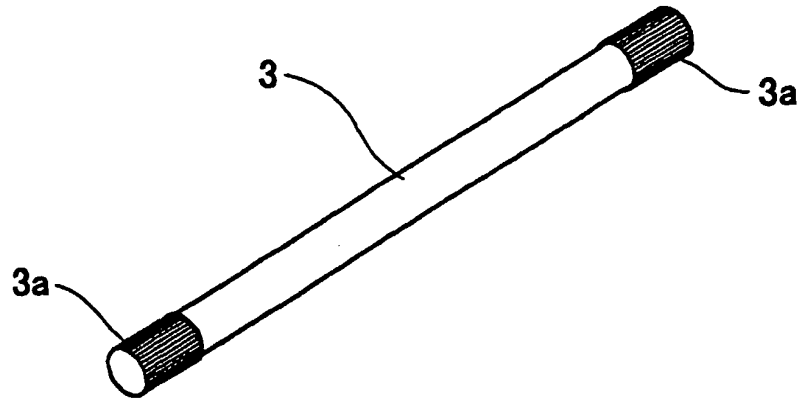


FIG. 48

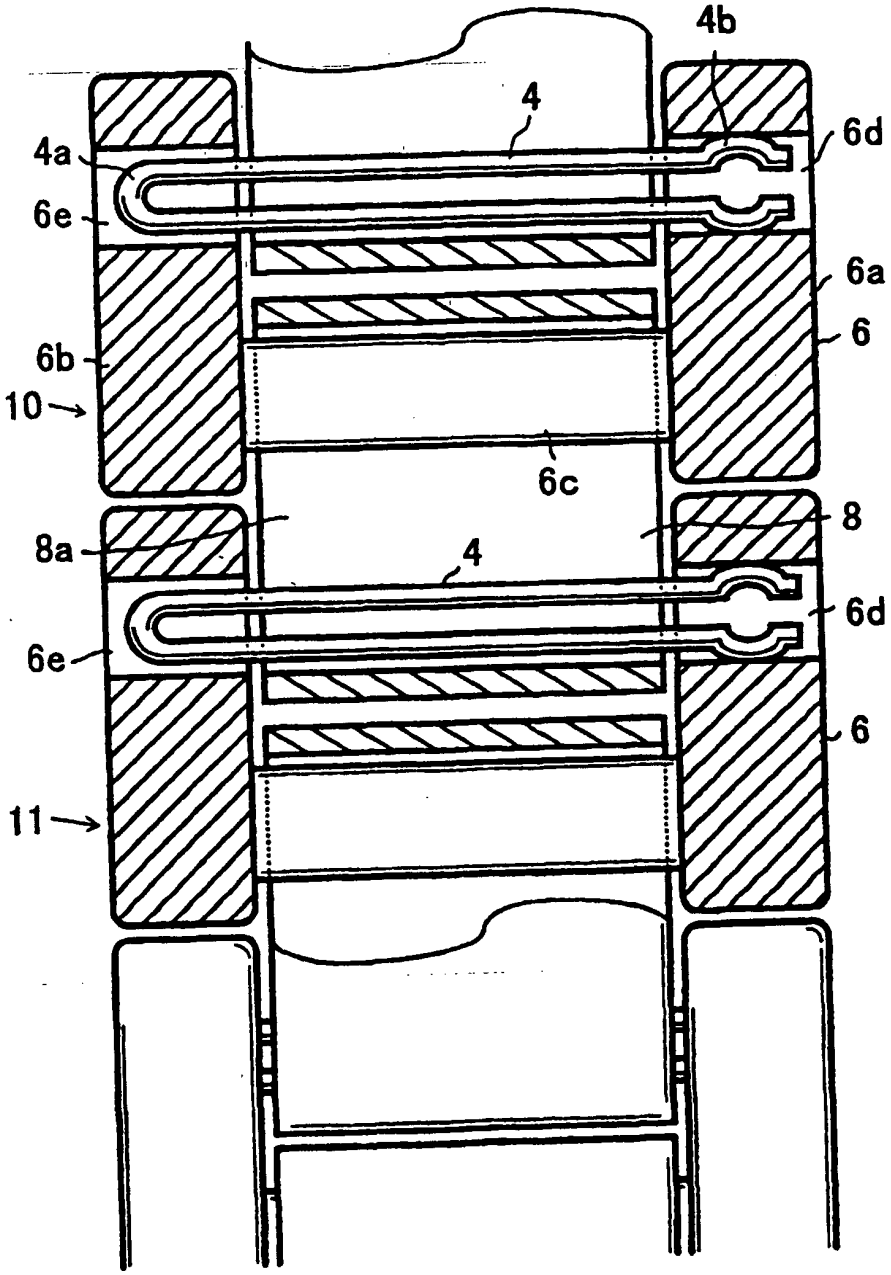
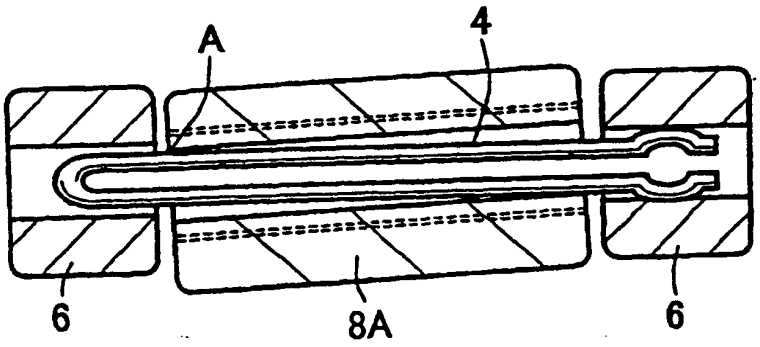


FIG. 49



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP99/05087

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[6] A44C5/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[6] A44C5/10, A44C5/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1926-1999 Toroku Jitsuyo Shinan Koho 1994-1999
Kokai Jitsuyo Shinan Koho 1971-1999

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
ECLA A44C5/10

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No.100962/1982 (Laid-open No. 007603/1982) (Nippon Seimitsu K.K.), 18 January, 1984 (18.01.84) (Family: none)	1-10
Y	JP, 57-020204, A (Kabushiki Kaisha Banbi), 02 February, 1982 (02.02.82) & US, 4463625, A & DE, 3205415, C	4,13
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No.046932/1982 (Laid-open No.166708/1983) (Tonan Kinzoku Kogyo K.K.), 07 November, 1983 (07.11.83) (Family: none)	5
X	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No.085753/1974 (Laid-open No.013756/1976) (Matsumoto Seiki K.K.), 31 January, 1976 (31.01.76) (Family: none)	11,12

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search
14 December, 1999 (14.12.99)

Date of mailing of the international search report
28 December, 1999 (28.12.99)

Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP99/05087

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP, 05-228573, A (Ishikawajima-Harima Heavy Industries Co., Ltd.), 07 September, 1993 (07.09.93) (Family: none)	14
Y	JP, 10-009234, A (Kabushiki Kaisha Yamahiro et al.), 13 January, 1998 (13.01.98) (Family: none)	14
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No.068270/1988 (Laid-open No.171205/1989) (CITIZEN WATCH CO., LTD.), 04 December, 1989 (04.12.89) (Family: none)	15,16

Form PCT/ISA/210 (continuation of second sheet) (July 1992)